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ABSTRACT

Evaluated were the effects of symbol versus speech training instruction on the behavior of four autistic children (8-9 years old). Following observation of their classroom and free play behavior, Ss participated in a training sequence involving Peabody Rebus Reading symbols and more traditional speech training procedures. Ss' inappropriate behavior (including self stimulation, echolalic speech, self-destructive behavior, and tantrum behavior) was recorded. Analysis of data indicated that two Ss showed no significant difference in inappropriate responding during the two types of instruction; one S showed slightly fewer inappropriate behaviors in speech training, and one S demonstrated fewer inappropriate responses in rebus training. Results suggested that the primary dysfunction in autistic children may be an inability to deal with all symbols, verbal and nonverbal, rather than strictly a language deficit. (CL)

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Final Report

Project No. H02625J
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A PREMACKIAN APPROACH TO DEVELOPING COMMUNICATION IN AUTISTIC CHILDREN

(A Comparison of the Effects of Symbol Versus Speech Training on the Behavior of Autistic Children)

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Department of Special Education

Kent, Ohio

August 1975

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U.S. DEPARTMENT OF
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A COMPARISON OF THE EFFECTS OF SYMBOL VERSUS SPEECH TRAINING ON THE BEHAVIOR OF AUTISTIC CHILDREN

A dissertation submitted to the
Kent State University Graduate School of Education
in partial fulfillment of the requirements
for the degree of Doctor of Philosophy

by

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I would like to dedicate this study to the memory of Dr. Louis Fliegler under whose auspices it was begun. As teacher, advisor, and friend, he offered professional advice and personal encouragement which contributed to its completion.

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CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

Introduction

Recent court decisions have made it mandatory for many states to provide an appropriate education for all children who had formerly been excluded from public school programs (Children's Defense Fund, 1974). Among this group of severely handicapped children are those labeled "autistic." Providing programs of quality for this group of children has been complicated by the fact that the etiology and treatment of the disorder is still being disputed by experts in the field.

The word "autism" was first used by Kanner (1943) to describe a specific psychosis of childhood caused by a physiological predisposition to the disease occurring in the presence of a hostile enviornment. The characteristics of the psychosis which Kanner described were an inability to form social relationships, a marked resistance to change, and peculiarities of speech and language. At present the terms "autistic" and "autistic-like" are used by professionals and laymen to describe a number of children who have severe disorders of communication and behavior, but whose diagnoses may vary from "schizophrenic" to "brain damaged." Whether autism is a specific disease with a definable cause or a behavioral syndrome with a number of causes is a matter of debate among professional concerned with the disease.

Theories of causation range from biochemical disturbance to environmental stress and the type of treatment prescribed for a specific child depends upon the orientation of the therapist.

In the past decade many treatment centers for autistic children have shifted the orientation of their programs from psychotherapy to education (Rimland, 1970). This shift has occurred because of the often disappointing results of psychotherapy with children (Levitt, 1963) and because of demonstrable gains made by autistic children in structured educational settings (Bartak & Rutter, 1971; Schopler & Reichler, 1971). The emphasis of many of the educational programs described in the literature is on acquisition of appropriate social and language behaviors by the child and upon the elimination of inappropriate behaviors which may interfere with learning.

Despite the proliferation of educational treatment programs there has been little research done on the effects of specific cognitive tasks on the learning and behavior of autistic children. This type of information will be necessary in the development of a suitable curriculum for such children. This task is particularly imperative because of the responsibility now placed on public education for providing relevant programs for all children. This study seeks to investigate one aspect of the learning of autistic children in order to expand the knowledge of curriculum development necessary for proper educational programming.

Statement of the Problem

A review of many studies on autism has led to conclusions such as

the following by Rutter, Bartak, and Newman (1971):

> Clinical, comparative, and experimental studies of autistic children of all levels of intelligence have demonstrated the presence of a severe and extensive defect in language comprehension (p. 163).

All autistic children exhibit this severe abnormality in language comprehension by behavior which includes inability to follow directions, inconsistent response to sound, and peculiar abnormalities of speech such as pronomial reversion and echolalia. Until recently, speech and language therapy had consisted of attempts to increase vocalization of words and, eventually, meaningful sentences by these children. In the past year, however, interest has turned to studies investigating a new form of symbolic language which holds the promise of providing a rudimentary communicative system for persons with severe language disability.

These studies which are investigating alternative means of establishing communicative techniques in non-verbal subjects have as their basis the work of David Premack (1971). Premack mapped the language in a chimpanzee by teaching her to place three-dimensional plastic symbols, each denoting a word, on a magnetic board. The chimpanzee learned to communicate such concepts as: (a) the interrogative, (b) metalinguistics, (c) class concepts, (d) the logical connective, if-then. The Premackian system of communication eliminated the need for holding a verbal image in memory, for complicated decoding of a verbal symbol, and for vocalization.

This method was first applied at the New York University Institute of Rehabilitation Medicine. Twelve aphasic subjects learned a rudimentary communication system using plastic symbols (Pines, 1973).

Hodges and Deich (1974) and Hollis and Carrier (1975) then adapted the Premackian approach for severely retarded, mute subjects. Their results indicate that the use of plastic symbols enables severely retarded subjects to establish a formal communicative system which bypasses their defects in attention, memory, and vocalization.

Another approach to using symbols for enhancing communication has been investigated by Woodcock, Clark, and Davies (1968). They developed the Peabody Rebus Reading Program for children, who for one reason or another were having difficulty with the reading process. The program consists of programmed readers and cards with rebus symbols printed on them. Each symbol denotes a word or an action. Recently the authors have applied rebus training in combination with American Sign Language to the teaching of young hearing impaired and Down's Syndrome children (Clark, Moores, & Woodcock, 1973).

Thus far none of the studies investigating the uses of symbols in communication have dealt exclusively with autistic children, who would certainly be classified as significantly language impaired. There has been some suggestion in the literature that the language impairment is indeed the primary dysfunction in the autistic syndrome (Rutter, 1969) and that the bizarre behaviors exhibited by these children are secondary to their inability to master their environment (Baumeister & Forehand, 1973; Churchill, 1970; Rutter, 1969). Hodges and Deich (1974) hypothesized this frustration relationship in their study of retarded, mute subjects but found no reduction in negative behaviors with the advent of a communication system.

This study will seek to determine whether the use of rebus symbols

in communication training with autistic children will bypass their specific communicative deficiencies. It will also seek to determine whether the communication training with symbols will have any effect on their inappropriate responses. To do this the inappropriate responses of four autistic subjects will be measured during two types of instruction: rebus training and standard speech and language training. If there is a connection between the type of responses required of the child and inappropriate behavior the contrast between these two types of instruction, one which requires non-verbal responses and one which requires verbal responses, should make that connection apparent. The specific research questions to be answered by this study are:

1. Will the inappropriate behaviors exhibited by the four children in response to stimulus presentations be less during rebus than during speech training?

2. Will the inappropriate behavior exhibited by the four children between tasks be less during rebus than during speech training?

CHAPTER II

REVIEW OF THE LITERATURE

Etiology

The main controversy over the causation of autism centers around those who believe that autistic behavior is the result of environmental stress and those who believe that it is primarily the result of central nervous system dysfunction. The early sixties saw a shift in the opinion of many experts in the field to the theories of organic impairment, but the psychogenic theories are far from dead. Recently, the theories of Tinbergen (1972), a Nobel prize winning ethologist, have reasserted the view that at least some autistic behavior may be the result of environmental stress. What follows is a summary of a few of the most prominent theories.

Psychogenic Theory

The psychogenic theory of the origin of autism was first given credence by Kanner (1943) who originally described the syndrome as being an inherited inability to form social relationships, but who later came to place more emphasis on the emotional coldness of the parents of such children (Kanner & Eisenberg, 1955). Bettelheim, one of the most well known therapists of autistic children, further extended this psychogenic view by stating that autistic withdrawal of the infant was caused by the "negative emotions with which the most

significant figures in the environment approach him (Bettelheim, 1972, p. 66)." His book The Empty Fortress was widely publicized although he has yet to specify what type of interaction between mother and child could produce such catastrophic results so early in life. Bettelheim claims to have a greater success with his type of prolonged psychotherapy than other programs have with autistic children, but his exclusion of six of the most impaired children from his final evaluation biased his results (Bendar, 1970).

The psychogenic theories were beginning to wane when the ethologist Tinbergen and his wife diverted their interests from the observation of seagulls to the observation of autistic children and in the process created a new theory (Tinbergen & Tinbergen, 1972). The Tinbergens, unlike Bettelheim, do not believe that there is one cause of the disease but that "a number of cases may well be largely induced by the environment (p. 34)." The Tinbergens' theory states that this environmentally induced autism is a result of the child's "desperate frustrated attempts at socialization combined with intense fear (p. 34)." This conflict is caused by a timidity on the part of the child and an overintrusiveness on the part of the child's significant caretakers, according to the Tinbergens.

Criticism of such theorizing is best exemplified by statements such as Rutter's (1969). In his view the psychogenic theory of autism can be faulted on three counts. The first is that no one has shown or substantiated the specific types of parental behavior which lead to such severe behavior disorder so early in childhood. Secondly, it is possible that pathogenic behavior observed in the parents of

autistic children is the result of interaction with a deviant child. Thirdly, many of the studies such as Bettelheim's may have included children who had suffered severe trauma in early childhood or children who were extremely withdrawn but not autistic. Rutter states, "it has not been clear whether children studied have had infantile autism or some other psychotic disorder (p. 389)."

Organic Theory

Organic theories attribute the primary cause of autistic behavior to disruption in the brain or central nervous system. Bizarre and stereotyped behaviors may be the result of this damage or may be secondary to it. Particular cites of dysfunction are sometimes specified, but often cognitive or perceptual peculiarities of the children are described and underlying brain damage assumed. A few of these theories of organic impairment are reviewed below.

Biochemical abnormalities. A number of propositions which attribute autistic behavior to faulty biochemical functioning in the brain have been given serious consideration by researchers. These range from brain allergy to adrenaline processing disturbances. The source of the dysfunction is thought to be genetic, as in the case of diabetes or phenylketinuria (PKU). One of the most interesting theories of biochemical abnormality in mental disorder derives from the study of the brain chemistry of schizophrenics (Gunderson, Autry, Mosher, & Buchsbaum, 1974). Although this research is in its beginning stages and is far from conclusive, it points to a disturbance in enzyme activity in the brain which causes abnormalities in the enzymatic processing of tryptophan. Normally tryptophan is broken down into

serotonin and tryptamine. It has been hypothesized that in schizophrenics this enzymatic process is disrupted and an hallucenogenic substance, dimethyltryptamine (DMT) is produced instead. Thus far this particular enzymatic disturbance has not been demonstrated in autistic children although their behavior has been compared to the behavior of adult schizophrenics and in an unrelated study a defect in serotonin release from platelets has been demonstrated in children with classical symptoms of the disease (Boullin, Coleman, O'Brien, & Rimland, 1971).

These studies indicate that the surface has just been scratched in the knowledge of the biochemical functioning of the brain. It is entriely possible that future research will reveal that all severe mental disorders are the result of biochemical disorder. For the present, however, these disorders must be investigated and treated from all directions.

Abnormalities in attention and arousal. The reticular formation is located in the brain stem and is thought to process incoming stimuli and channel them to the cerebral cortex. The reticular formation is also thought to govern attention and arousal. In his book Infantile Autism which won the Century Psychology Series Award in 1963, Bernard Rimland speculated that the origin of autistic behavior might be found in this structure. In his view autistic children do not have the ability to "relate new stimuli to remembered experience (p. 79)" and that this is one of the functions of the reticular formation. Rimland has since shifted his views to favor biochemical theories of causation, but other researchers have

implicated attention and arousal. Investigations by Hutt, Hutt, Lee, and Ourstead (1964) have documented an abnormal EEG pattern in autistic children which shows a high state of physiological arousal. And recent research by Lovaas, Schreibman, Koegel, and Rehm (1974) has reported that autistic children respond to only one component of a complex stimulus indicating overselective attention. Whether these findings are the result of a primary or secondary problem has yet to be determined.

Abnormalities in sensorimotor integration. The alternating excitation and inhibition of the sensory motor patterns of autistic children have been investigated by Ornitz and Ritvo (Ornitz, 1971). When the environment of such children was held constant, it was observed that they engaged in periods of hyperactive repetitive motor movement alternating with periods of quiet behavior (Sorosky, Ornitz, Brown, & Ritvo, 1968). Ornitz (1971) attributes this behavior to a disorder of the homeostatic regulatory system which integrates sensory input and motor output. Evidence tentatively supporting this view was presented by the investigators in studies which documented abnormalities in regulation of motor output and sensory input in rapid eye movement (REM) sleep cycles and in the waking state in autistic children.

According to this theory of autism, the bizarre motor movements of autistic children such as hand flapping are, "internally driven or released rather than voluntarily expressed (Ornitz, 1971, p. 57)." And the social and language disorders evidenced by these children are secondary rather than primary.

Abnormalities in social relatedness. Kanner (1943) described the disease as an inborn defect in the ability to relate to others. The bizarre behavior and language problems of the children were thought to be secondary to this defect. Recent research by Reichler and Schopler (1971) reports that human relatedness is highly dependent on the organism's ability to relate to the world around him. This ability depends upon intact perception. In their view the primary problem is in perception, the impairment of which disturbs relatedness. Rutter (1969) echoes this theme when he states:

> It is difficult to differentiate between poor social perception and a general impairment in symbolic functioning or language comprehension (p. 393).

He reviews studies which indicate that improvement in the social behavior of autistic children is not accompanied by a dramatic improvement in language skills. As in the case of the attention and arousal theory, inability to relate to others may be a secondary manifestation of the disease rather than the primary cause.

Abnormalities in language and communication. The one characteristic which all autistic children demonstrate is severely disturbed language functioning. This disturbance manifests itself in language behavior which may include mutism, echolalia, pronomial reversal, and difficulty in following directions. For this reason Rutter (1969) and others have hypothesized that the primary cause of autistic behavior is severe language impairment. This theory is supported in studies by Hermelin and O'Connor (1967) which show that autistic children do not group words according to concepts for memorization as normal and even retarded children do. This is an indication that

to autistic children the words have no meaning.

A related area of research which deals with auditory processing suggests a possible explanation for the inability to develop proper communication skills. William Condon (1974) has studied films of autistic children and discovered that they appear to either hear sound twice, or a feedback mechanism makes them react as if they do. This research is in its beginning stages but is one of the most interesting of the new theories to be presented. It is apparent that some autistic children do react to sound in an erratic manner. Sometimes they appear to hear and sometimes they give the impression that they are deaf. Whether faulty auditory processing is the cause of language impairment is not known, nor has it been demonstrated that such faulty processing occurs in all autistic children.

The one factor which makes the language theory most attractive as an explanation of autism is that language impairment can occur for a variety of reasons. Brain damage, retardation, emotional disturbance are all known to produce language impairment. This might explain the number of children with varying diagnoses who have been labeled "autistic."

Another interesting aspect of the language theory is the concept of bizarre and stereotyped behavior of such children as being a secondary reaction to the inability to communicate. Rutter (1969) describes such behavior "as one means of the child's dealing with his handicaps--a maladaptive attempt to come to terms with his defects--as it were (p. 405)." Churchill (1970), in a summary of the Indiana University treatment program for autistic children, describes what

happens when the child cannot master a task:

> If the level of difficulty is raised or changed in some way so that the child begins failing, a number of interesting things ensue. The rituals return, the child's attention wanders, and he begins to act in a teasing, negativistic way. . . . One wonders to what degree the bizarre and autistic features manifested by psychotic children are really secondary phenomena--the results of unrelieved frustration and inevitable failure in an incomprehensible world (p. 442).

And Baumeister and Forehand (1973) in a review of research on stereotyped acts admit that each of several theories attempting to explain the origins of such behavior are plausible, but that they believe stereotyped acts are essentially normal behaviors which have been conditioned to "function to a variety of cues (p. 92)." One of those cues, according to Baumeister and Forehand, is frustration.

Treatment

In the past, treatment programs for autistic children have been few and far between. Parents were forced to choose between residential facilities which charged extremely high fees or state institutions which gave only custodial care. Until recently autistic children were completely excluded from public education. With the advent of the Children's Rights movement has come pressure to provide educational programs for all children. At the same time the shifting concepts of the disease have provided the impetus for the establishment of treatment programs which rely heavily on education as a means of changing behavior. At present the most successful programs stress operant conditioning techniques for eliminating problem behavior and vary the instructional methods and materials with a heavy emphasis on speech and language training. This is in sharp contrast to the programs of

earlier years which depended on psychotherapy. An example of different types of treatment programs follows.

Psychotherapy

The type of treatment provided autistic children depends upon the orientation of the therapist and his preferred ideas of etiology. The hypothesis underlying the use of psychotherapy is that the severe behavior disorder of autistic children was caused by a faulty interaction between the child and his major caretaker, usually the mother. Treatment is conducted in a residential setting away from parents and home. Often such treatment may continue for a number of years at great expense. Children are encouraged to regress to lower developmental stages and to progress back through them with the help of the therapist.

Perhaps the most well-known of the psychotherapeutic treatments is Bettelheim's program at the Orthogenic School in Chicago. As previously mentioned, his program is difficult to evaluate because of the confusion over original diagnoses and faulty evaluation procedures (Bendar, 1970). It is certainly feasible that some children may respond to such treatment. The best indications are that approximately one-third of the children treated in such programs make a good adjustment, one-third make a fair adjustment, and one-third make a poor adjustment (Bendar, 1970). It is not clear whether these results would have been obtained if no treatment had been provided. Usually, the group of children with signs of organic brain damage made the poorest adjustment.

In a review of psychoanalytic treatment programs for children

with all types of mental disorders, Levitt (1963) evaluated the results of several treatment programs in which control and experimental groups to indicate that psychoanalytic treatment was effective in changing children's behavior. While this type of experimental design may miss single cases which show improvement, Levitt's review indicates that psychoanalytic treatment of children may not be as effective as has been indicated by some professionals.

Behavior Therapy

In a recent summarization of his behavior therapy treatment program for autistic children, Lovaas (Lovaas, Koegel, Simmons, & Long, 1973) reports that all children treated (20) improved to some extent, but that continued progress outside of the treatment center depended on the training of their parents or caretakers in operant conditioning techniques. He has now shifted the emphasis of his treatment program to the training of parents.

The impressive facts about Lovaas' program are that he did not preselect his subjects, that all subjects improved to some extent, and that his precise observational techniques made it possible to document actual changes in behavior. Lovaas has some interesting comments to make about preselection of subjects in autistic studies:

> A good diagnostician can select his patients so that the majority of the children would eventually improve independent of the treatment offered. No doubt such preselection of patients which would yield a much more favorable base rate change than is true of a non-selected group keeps many non-functioning programs alive (p. 158).

A program using some of the same principles has been developed for the state of North Carolina by Reichler and Schopler (1971).

Operant conditioning techniques are used in classrooms with special education curricula, and parents are trained to be teacher therapists. Most of the new educational programs for autistic children employ such techniques because they produce desirable results in a limited amount of time and give parents a means for coping with problem behavior. Behavioral therapy also is usually accompanied by observational procedures which are valuable in assessing progress of the child.

The criticisms of behavior therapy are many and varied. Many people object to the use of punishment and time out with severely disturbed children. Lovaas himself (1974) has presented the view that the effects of operant conditioning techniques are not generalizable, tangible reinforcers make behavior susceptible to extinction, and these techniques of control do not tap the real perceptual and motivational problems of autistic children. They remain, however, the most effective and in many ways the most humane means for dealing with such children at the present time, for they take the burden of guilt from parents and enable them in many cases to keep the child at home.

Drug Therapy

Drug therapy for autistic children is usually initiated for either of two reasons. One is to control the often hyperactive, destructive behavior of the children. The other is in the belief that the primary cause of autistic behavior is a biochemical disturbance in the brain and that certain chemicals can reverse the process.

In a survey of parents of afflicted children which was conducted

by Rimland (1974), the effects of controlling drugs, such as amphetamines and tranquilizers, were rated by the parents as being pretty much the same. The average percent of parents who rated their children as improved on all drugs was 28 percent. The average percent of parents who rated their children as having worsened on all drugs was 27 percent. It does not appear from this study that the controlling drugs have an appreciable effect on the behavior of autistic children.

Rimland believes that therapy with massive doses of B vitamins may correct the biochemical anomaly in the brains of autistic children. In another parent rating study conducted by Rimland, 66 percent of parents responding rated their children's behavior as having been improved by the vitamin therapy. The obvious problem with this type of study is the use of parents as raters of their own children's behavior. A double blind study to investigate the effects of the B vitamins on the behavior of autistic children is now in progress to either confirm or deny Rimland's hypothesis.

Recently, therapy with a thyroid hormone (tri-iodothronine) has reportedly changed the behavior of autistic children dramatically, making them less withdrawn and more alert (Campbell & Fish, 1973). This study is the first to have reported such an effect and has not been duplicated.

At present, neither drug therapy nor vitamin therapy has been proven conclusively to alter the behavior of autistic children.

Summary

This review of theories of causation and treatment indicates the confusion in the field and the difficulties faced by anyone charged

with developing a comprehensive educational program for such children. Each one of the theories presented is logical and has a respectable amount of research evidence to support it. It is entirely possible that any of the circumstances described by these investigators may cause autistic behavior. What the educator is faced with is a collection of children who may exhibit the same type of behavior but whose backgrounds and diagnoses may vary. The task of the educator in this situation is to find out what methods of instruction eliminate inappropriate behavior and increase competence in language and social behavior.

The former question has, to a large part, been answered. Operant conditioning techniques are effective in controlling behavior when they are used systematically. But they are not a curriculum of instruction, and although it is believed by some professionals that nothing can be taught when the child is engaged in inappropriate self-stimulatory behavior (Lovaas et al., 1973), eliminating problem behavior should not be the only eudcational goal for these children. Research investigating the effects of different types of cognitive tasks on the behavior of autistic children seems to be an appropriate first step in the development of a program which seeks to teach as well as to control. Unfortunately, this aspect of research has been neglected. Bartak and Rutter (1971) agree that, "the apparent association between task competence and social behavior warrants more systematic investigation (p. 277)."

This study attempts to select one of the hypotheses of causation (primary language dysfunction), to apply a new method of teaching

communicative skills to four autistic subjects, presumably bypassing their specific language dysfunction, and to measure the effects of this instruction on their behavior. This study should provide some information about the language deficit hypothesis, and indicate whether symbolic instruction enhances learning and has an effect on the behavior of autistic children.

CHAPTER III

METHOD

Subjects

Four children were chosen from a classroom for severely emotionally disturbed children in a school for the trainable retarded. Although all children tested below 50 IQ on standard intelligence tests, their behavior suggested severe emotional disturbance, and they had all, at one time or another, been labeled autistic, autistic-like, or schizophrenic by agencies not connected with this study. The four children were chosen from a group of eight and were selected after classroom observations indicated that they exhibited inappropriate behavior a large percentage of the time. After the subjects were selected, their records were perused and language and behavioral data collected. Observational and recorded data substantiated that each child exhibited at least five of the seven characteristics listed by Lovaas et al. (1973) as being indicative of autism:

1. apparent sensory defect--at times they appear not to be able to hear and may look through persons rather than at them.

2. severe affect isolation--indifferent to affection; do not respond to social stimuli.

3. self-stimulatory behavior--a high incidence of repetitive motor movements

4. language disorders--either mutism or echolalic speech

5. minimal receptive speech--inability to follow complex directions

6. minimal social or self-help skills

7. self-destructive or mutilatory behavior

The behavioral characteristics and standard test scores of the subjects are included in Table 1. A description of each subject follows.

Subject One

Subject one is a female, age eight, who exhibited the most continuous self-stimulatory and disruptive behavior of the four subjects. Her early developmental history was described as normal although she didn't walk until fifteen months. At four years of age she was referred to a speech and hearing clinic and a child guidance clinic. She entered the trainable facility in 1973 and had been in the classroom for approximately one year prior to this study. Her records contained the following comments: "autistic-like, aphasic, no receptive or expressive speech, appears deaf, self-stimulatory behavior, mute, covers ears, tantrums." Attempts to test the subject had been unsuccessful.

Classroom observations of Subject One in group instruction demonstrated that she exhibited inappropriate behavior in 88 percent of 10-second intervals recorded. Her self-stimulatory behavior was the most subtle and difficult to record of all four subjects. She turned her head slowly from side to side, rolled her eyes, fixated her eyes on objects, tapped objects, held her ears, and smelled her fingers. During sessions in which language samples were collected, Subject One did not emit any intelligible propositional or echolalic utterances. Her verbal utterances consisted of screaming and crying.

TABLE 1

Subject Data

Subject	Sex	Age	IQ[a]	SQ	PPVT	Apparent sensory defect	Affect Isola.	Self-stim.	Language disorder	Minimal rec. speech	Minimal soc. skill	Self-destruc.	Diagnosis
1	F	8 yr	-	-	1 yr-11 mo	+	+	+	+	+	+	-	Autistic-like
2	F	8 yr	36	-	3 yr-3 mo	+	-	+	+	+	+	-	Schizophrenic
3	M	9 yr	30	58	2 yr-2 mo	+	+	+	+	+	+	+	Autistic-like
4	F	8 yr	41	45	3 yr-5 mo	+	+	+	+	+	+	-	Autistic-like

[a]Stanford Binet Intelligence Test

Subject Two

Subject Two is a female, age nine, and the only one of the four subjects to consistently seek and respond to affection. Her developmental history was also reported to be normal, although she did not walk until fifteen months. Early diagnostic work was sketchy in the recorded history, but it is known that she was seen by a child guidance and speech clinic prior to her entering the trainable program. Abnormal electroencephalographic (EEG) findings had been reported. Previous educational treatment, before entering the trainable program about two years prior to this study, had consisted of speech training. Her records contained the following comments: "no eye contact, expressive aphasia, bizarre motor movements of upper extremities, psychiatric disorder (schizophrenic), echolalic speech, fixates on objects, unable to hear." Attempts to test the subject had been successful and a Stanford Binet score of 36 was obtained.

Classroom observation of Subject Two in a group instructional setting demonstrated that during 68 percent of 10-second intervals the subject was engaged in self-stimulatory and inappropriate behavior. Her self-stimulatory movements were very bizarre and easy to record. They included rocking of the body back and forth with the legs tightly crossed, and flipping of the hands and fingers. During these movements the subject often fixated her gaze on objects.

Her speech consisted of frequent echolalic and occasional appropriate propositional utterances. The echolalic utterances were phrases and short sentences containing personal pronouns, proper nouns, nouns, the be verb, verbals, adjectives, adverbs, and demonstratives.

Example: "It's dark, it's nice out. Snow is going to hurt you."

Her appropriate responses to interaction with the teacher were short phrases and one word responses. They contained nouns, adjectives, verbals, and demonstratives. Appropriate verbal responses were infrequent. Usually when the teacher asked a question, Subject Two would respond with an echolalic phrase containing the stimulus item within it. Example: Teacher, "How many cars are there?"

Subject, "Car's gonna hurt you."

Subject Three

Subject Three is a male, age nine, who exhibited the least inappropriate behavior of the four subjects. His early development was reported normal until the first year when his development appeared to plateau. Language did not develop properly and he did not walk until 20 months. A neurological examination indicated the occurrance of many petit mal seizures. The subject had had one year of speech training, and one year of nursery school training prior to his enrollment in the trainable program. His history contains some of the following comments: "distractible, short attention span, emotional disturbance, more attentive in non-verbal tasks." Subject Three received a score of 30 on the Stanford Binet.

Classroom observation in a group setting showed that this child exhibited inappropriate behavior in 63 percent of 10-second intervals recorded. His inappropriate behavior consisted of tapping and hitting objects, rubbing his body, eye blinking (which may have been the result of seizure activity), and occasional rocking. Prior to inclusion in this special classroom, Subject Three had evidenced much self-

destructive behavior. This behavior only occasionally resurfaced in the form of hand and arm biting.

His language sample consisted of echolalic and propositional utterances. Mainly, his echolalia consisted of imitating the teacher's questions and statements. Example: Teacher, "Who is that, Bill?" Bill, "Hello Bill." His propositional utterances were single nouns in response to pictured stimuli. Example: Picture of a truck. Subject, "truck." He also initiated some naming of his body parts. Occasionally he would include an article or demonstrative with the noun. Example: "a car" or "that a boy." He was unable to expand his naming responses or give the function of objects when the teacher conducted an inquiry.

Subject Four

Subject Four is a female, age eight, who exhibited widely vacillating behavior from day to day. Her developmental history indicated that she evidenced feeding and sleeping problems and did not walk until 21 months. At the age of two she had a vocabulary of ten words, but at the age of four her language was mainly echolalic. Early EEG reports indicated abnormalities but recent reports were normal. She had had numerous diagnostic evaluations including a month's stay at a psychiatric hospital. She had entered the trainable program two years prior to the initiation of the study. Her records contained the following comments: "hyperactive, low frustration tolerance, distractible, autistic-like, good memory, retarded emotionally and socially, brain damage, no b[illegible]in damage." Her score on the Stanford Binet was 45; but the examiner expressed the opinion that this child was capable

of better performance.

Classroom observation prior to the study showed that Subject Four produced inappropriate behavior in 61 percent of 10-second intervals recorded. This inappropriate behavior took the form of energetic rocking, rolling of the eyes, biting of her clothes, screaming, and out of seat behavior.

Her speech was characterized by propositional and infrequent echolalic utterances. Responses to the teacher were not consistent but were appropriate. Occasionally verbal interaction was initiated. Example: "Play Bancy." "Color Bancy." Her language included personal pronouns, proper nouns, verbs, the be verb, adverbs, adjectives, negatives, affirmatives, demonstratives, articles, and plurals. The phrasing sequence was usually that of a verb plus an object. She did not appear to use the subject-verb-object sequence for sentence formulations.

Setting

The study was conducted in a small room (7' X 10') adjacent to the classroom for behaviorally disturbed children at a county facility for the trainable retarded. The room was equipped with a table and three chairs for the subject, teacher, and observer. The room was not soundproof and the normal sounds of the adjoining classroom often were heard in the small room in which the research study was conducted.

Stimulus Materials

Rebus Materials

Rebus materials from the Peabody Rebus Reading Program (Woodcock

et al., 1968) were used for the symbol training portion of the study. These materials were chosen because they were part of a standardized glossary of symbols, and materials suitable for classroom use had been developed. The rebus materials included symbol cards (4" X 3") on which each rebus symbol was printed. The symbols were often similar to the words which they denoted; e.g., apple/picture of apple. The cards denoted nouns, verbs, pronouns, prepositions, adverbs, adjectives, and articles. Also included in the rebus materials were workbooks and a manual pairing symbols with American Sign Language. These were used sporadically in the study, but the workbooks, particularly, were difficult to score.

During rebus training plastic objects were used as stimulus items. These items included pieces of fruit, flowers, items of clothing, and cars and trucks.

Speech Materials

Instructional materials for speech training were picture cards denoting objects and actions, and plastic objects.

Reinforcers

The teaching of autistic children has been shown to be facilitated by using operant conditioning techniques (Lovaas et al., 1973). Such techniques often employ tangible reward and punishment. Because the purpose of this study was to compare the effects of instruction on behavior rather than to control behavior only reinforcement and extinction procedures were used. This type of procedure, rather than punishment or time out, is more likely to be used in public school

classrooms.

Reinforcers used were candy, cereal, and pretzels. Reinforcers were delivered on a variable interval schedule. Each child received the same number of reinforcers each day on the following schedule:

1. Twenty reinforcers--sessions 1-5
2. Ten reinforcers--sessions 5-15

Design

The study was designed to provide accurate observations of the behavior of the four subjects during speech and rebus instruction. The particular behavior of interest and the dependent variable was inappropriate behavior. A detailed description is included in the Observation section. The independent variables were the speech and rebus training conditions. The sequence of data collection sessions is described below.

1. Classroom observations of children in group instruction in the classroom--four days.
2. Observation of children in a free play condition in the experimental room with the teacher and observer present--six days.
3. Observation of children in a structured baseline condition in which they were asked to complete fifteen verbal and non-verbal tasks without reinforcement--six days.
4. Observation of two children in a training sequence as follows: speech, rebus, speech, rebus. Each session lasted for fifteen days followed by one free play and one structured baseline session (probes) in which no reinforcement was used.

5. Observation of two children in a training sequence as follows: rebus, speech, rebus, speech. Each session lasted for fifteen days followed by one free play and one structured baseline session (probes) in which no reinforcement was used.

The materials and tasks used for the free play and structured baselines are included in Appendix A.

Training

Although this study concentrated on the collection of data concerning inappropriate responses to instructional stimuli, it was also, of necessity, concerned with the proper presentation and sequencing of instructional materials. Since the children were so different and the use of rebus symbols with autistic children had only been attempted once previously by the author (Blair, 1973), the rules of presentation were not spelled out in advance. However, the following procedure, adapted from Premack (1971), was rather loosely defined for rebus training prior to the beginning of the study.

1. Presentation of symbols; matching symbols to words, objects, or manual signs.
2. Sequencing symbols in order for an action performed e.g., "Nancy give apple Bill."
3. Introduction of concepts "same" and "different."
4. Introduction of the interrogative.
5. Introduction of "yes" and "no."
6. Introduction of other concepts; e.g., "name of," and "color of."

7. Introduction of concepts "on," "in," "under."

This order of presentation was roughly adapted from the procedure used by Premack (1971) in the training of Sarah. Children were started at step one and two to assess their approximate level of performance. Presentation of other levels depended upon the judgment of the teacher.

Speech training was easier to program because of the abundance of literature concerning proper order and sequencing of stimulus material. Language samples were collected by the teacher and observer who was a graduate student in speech pathology. Specific objectives were formulated for each child.

1. Subject One--The initial objective of speech and language training was to train simple verbal imitative tasks.
2. Subject Two--The initial objective for speech and language training was to train Subject Two to respond properly to a verbal questions by using the structure "proper noun plus verb" and to eliminate the use of "ing" for all verb endings.
3. Subject Three--The initial objective of speech and language training was to train Child Three to consistently respond to naming tasks.
4. Subject Four--The initial objective os speech and language training was to expand the "verb-object" phrase to a "subject-verb-object" phrase and to increase verbal interaction with the teacher.

After an initial period of development, the following assessment plan was implemented for the evaluation of speech and rebus training procedures.

After an initial period of development, the following assessment plan was implemented for the evaluation of speech and rebus training procedures.

1. Pretest--Each child was presented with a number of items chosen for his expected performance level. If tests revealed that the child completed 85 percent of the tasks correctly, he was moved to the next higher level.
2. Weekly test--Approximately every five sessions the child was retested on each task. If his score was above 50 percent and below 85 percent, instruction in that particular task was continued. If the score was below 50 percent the next lower level of the task was presented. If the score was above 85 percent, the next higher level of the task was presented.

During testing sessions the task was presented to the child with no help from the teacher. If an incorrect answer was given, a correction procedure was employed. Reinforcement and extinction were used.

During training, prompts or cues were kept to a minimum but each task was shaped so that the child had little chance of failure. In scoring, all prompted trials were eliminated from the final calculations.

Training was conducted five days per week except for illness. All children were present in the experimental room for 25 to 30 minutes per day. The number of stimulus items presented depended upon the complexity of the material and the performance of the child.

Observation

One of the most difficult and important aspects of this study

was the development of a suitable observation procedure which would capture the child's response to the specific stimuli and also give some indication of his behavior when not engaged in a teacher directed task. Several observation procedures had been developed for use with autistic children, but none were suitable for the particular type of information sought here. One study which dealt with the autistic child's reactions to stimuli was that of Koegel and Rincover (1974). That study was used as a model for the development of this observation procedure. However, that study did not deal with the child's off task behavior.

During the observer training phase of the study, it became apparent that the child could respond very quickly to a stimulus presented to him in an appropriate manner, but that immediately afterwards he might engage in a wide range of inappropriate responses. To record just the responses of the child to stimulus items would present a picture of a child responding appropriately a large percentage of the time when in fact he was engaged in inappropriate behavior for much of the training session. It was evident that the observation procedure developed for this study had to record both on task and off task behavior of the child during the training session.

Unelicited Behavior

Initially it was planned to score 10-second intervals for inappropriate behavior immediately after each stimulus-response sequence. However, presentation of the next stimulus was faster than expected, often interrupting the 10-second interval immediately following the responses. The first adjustment in the scoring procedure was an attempt

to pause for 20 seconds after each stimulus-response. This system was discontinued after two days because it made teaching tedious. The final compromise in this situation was to pause after every third stimulus-response sequence for a period of 20 seconds to obtain off-task inappropriate behavioral data. Although this procedure was not ideal, it gave some indication of behavior exhibited by the child when he was not responding to the task. This arrangement insured a random selection of intervals and prevented the teaching interaction from becoming stilted by requiring the teacher to pause after every stimulus presentation.

Intervals were marked with an X if any inappropriate behavior occurred in the 10-second interval. A general definition of inappropriate behavior was used prior to the beginning of the study. That definition was adapted from Lovaas et al. (1973) and included the following categories of behavior:

1. self-stimulation--any repetitive, stereotyped motor movements.
2. echolalic speech--any repetitive, parrot-like or nonsense speech.
3. self-destructive behavior--any attempt by the child to injure himself.
4. tantrumous behavior--screaming, hitting, kicking, or throwing objects.

After the study began, it became obvious that each child exhibited a highly individualized pattern of inappropriate responses, some of them extremely subtle. Therefore, inappropriate behavior was defined for each child. A complete list of the inappropriate responses of the four subjects is included in Table 2.

TABLE 2

Complete List of Inappropriate Responses for All Subjects

Subject One

1. Rolling her head from side to side.
2. Looking out of the corner of her eyes.
3. Putting objects in her mouth.
4. Staring at her hands.
5. Running her fingers around the edges of objects.
6. Tapping her fingers on objects.
7. Climbing on furniture.
8. Screaming and throwing objects at the teacher.
9. Rubbing parts of her body.
10. Repeated grunts and screams.
11. Hitting and kicking the teacher.

Subject Two

1. Rocking of her body when in a sitting position.
2. Staring intensely at her hands.
3. Flipping her fingers.
4. Staring intensely at objects while flipping her fingers.
5. Holding her body in a contorted position with legs tightly crossed.
6. Rapid movement of the legs and feet up and down when in a sitting position.
7. Bizarre speech of a depressing nature.
8. Immediate echolalia.

Subject Three

1. Staring intensely at objects.
2. Squinting and blinking his eyes.
3. Rubbing and biting parts of his body.
4. Tapping and pounding objects.
5. Contortions of the arms and hands.
6. Delayed and immediate echolalia.
7. Occasional high-pitched screaming.

Subject Four

1. Rolling and looking out of the corner of her eyes.
2. Staring intensely at objects.
3. Putting fingers, clothes, and objects in her mouth.
4. Clearing her throat and making clicking noises with her tongue.
5. Holding her head in a peculiar tilted position.
6. Rocking her body in the sitting and standing position.
7. Rubbing parts of her body.
8. Running around the room.
9. Climbing under furniture.
10. Tapping objects.
11. Occasional immediate echolalia.
12. Hitting the teacher.
13. Screaming.
14. Throwing objects.

The procedure of defining behaviors individually for each child was alluded to in a recent study by Koegel, Firestone, Kramme, and Dunlap (1974). The authors noted that "each child's self-stimulation was highly idiosyncratic, ranging from behaviors as subtle as saliva swishing to others as obvious as body rocking (p. 523)."

Elicited Behavior

To measure responses of the children immediately following the presentation of the stimulus a scoring procedure was adapted from the research study of Koegel and Rincover (1974). A stimulus was presented and the type of response which occurred within 10 seconds of the stimulus presentation was recorded.

Stimulus definition. Stimuli were scored as either verbal or non-verbal according to the responses required of the subject. For example, if a stimulus required a non-verbal response, even though that response dealt with language of some sort, it was scored as non-verbal. After initial adjustments, all stimuli presented in speech were verbal and all stimuli presented in rebus were non-verbal. Stimuli were defined formally as follows:

1. verbal stimulus--any stimulus which requires a verbal, oral response.
2. non-verbal stimulus--any stimulus which requires a non-oral response.

Response definitions. Responses were divided into four types.

1. correct response--any correct response to the stimulus presentation occurring within 10 seconds.
2. incorrect response--any incorrect responses to the stimulus occurring within 10 seconds.

3. inappropriate responses--any inappropriate behavior (as defined above) occurring within 10 seconds of the stimulus presentation.

4. late response--no response to the stimulus within 10 seconds of its presentation.

A trial was over immediately when one of the above responses occurred. The response of the teacher to the behavior emitted by the child was as follows:

1. A correct response was always reinforced with praise and at intervals with a tangible reinforcer.

2. An incorrect response was followed by a correction procedure which was scored as a prompted stimulus-response.

3. An inappropriate response was followed by a removal of the stimulus materials and a brief withdrawal of attention. The next stimulus was presented when the child was not engaged in inappropriate behavior. If the behavior persisted for 3 to 5 minutes, a stimulus was presented, and the correct response modeled and reinforced.

4. A late response was followed by a re-presentation of the stimulus.

Calculations

The percentage of inappropriate responses in both on task (elicited) and off task (unelicited) conditions was calculated in the following manner.

Elicited responses. All prompted stimulus-response sequences were discarded. Then the following calculations were performed:

$$\text{\% inappropriate responses to stimuli} = \frac{\text{total inappropriate responses} \times 100}{\text{total number stimuli present}}$$

Unelicited responses. All 10-second interval data was collected for each session and the following calculations performed:

$$\text{\% 10-second intervals in which inappropriate behavior occurred} = \frac{\text{total number of intervals in which inappropriate behavior occurred} \times 100}{\text{total number of 10-second intervals}}$$

Reliability

Reliability was obtained by having a second trained observer attend one session in each experimental condition. Because of the wide range of inappropriate behavior exhibited by each child, reliability was obtained on each subject. In addition to this procedure, videotapes were made and scored separately. However, the machinery was not sensitive enough to pick up the particularly subtle movements of some of the children and this method was discarded. If reliability scores fell below 80 percent, the observers were retrained.

CHAPTER IV

RESULTS

Subject Data

The following data are the results of training with rebus and speech instruction. All weekly assessment scores are presented in Appendix C. Percentage scores for inappropriate and correct responses are contained in Appendix D. Graphs and tables which present the percentage of inappropriate responses in the different teaching conditions are presented below.

Subject One

Baseline and probes. During the free play baseline, Subject One engaged in inappropriate behavior during 86 percent of 10-second intervals scored. This behavior consisted of screaming, throwing objects at the teacher, climbing on furniture, hitting the teacher and engaging in a variety of self-stimulatory behaviors. She did not play appropriately with any of the toys present in the room.

During the structured baseline Subject One scored zero correct responses on verbal tasks and 5.9 percent on non-verbal tasks. Inappropriate responses immediately after the stimulus was presented were 92.4 percent for verbal requests and 88.6 percent for non-verbal requests. She showed inappropriate behavior in 82.4 percent of 10-second intervals scored when she was not engaged in a task.

Subject One's reactions to probe sessions were consistent. During free play probes her inappropriate behavior remained at or below the level of the previous session. When the non-reinforced structured session was introduced, her inappropriate responses increased sharply. This was true of elicited and unelicited responses (Figures 1 and 2).

Speech training. Speech training began in Experiment I and continued in Experiment IV. All weekly assessment scores are contained in Appendix C. Initially the child was reinforced for any vocalization occurring within 10 seconds after the stimulus presentation, and then for approximations to the stimulus word occurring within 10 seconds. Attempts to establish stimulus imitation were largely unseccessful until the last sessions in the second phase of speech training when she responded with "ball" in 75 percent of the trials.

During speech and rebus training the subject emitted spontaneous phrases for the first time. These utterances included, "gotta go" and "good girl." They were never uttered when requested but during pauses when she was not required to emit a response. These utterances provided an indication that she could make words but that for some reason she would not. They occurred seven times during speech training and eight times during rebus training.

Speech training was not a success with Subject One, although at the end of the study she began to imitate. It is possible that with more intensive training, strong reinforcement and food deprivation or punishment, speech training would have been more successful. However, a previous attempt to establish imitation by a speech clinician had

failed after 90 sessions in which the child's lunch had been used as reinforcement. Because the child responded when not directly required to do so, indicated that a more non-directive approach to initial therapy such as reinforcing spontaneous utterances, might have overcome the barrier which prevented her from responding directly to a stimulus.

Rebus training. Rebus training was begun in Experiment I and continued in Experiment III. Subject One was reinforced for imitating manual signs which were paired with objects and symbols. The highest score she received was 63 percent for imitation of the sign for book. Other signing was less successful. During this initial phase of rebus training attempts to have Subject One select symbols for objects presented were unsuccessful. During the second phase of training these attempts were more successful although her responses were always inconsistent. For instance, one week she scored 100 percent in choosing the correct symbol for the object "banana." The next week she scored 42 percent for the same object. Rebus training never progressed beyond selecting the appropriate symbol for an object.

Although responses were inconsistent and no dramatic gains were made in communication with symbols, more correct responses were scored during rebus training. Table 3 presents the mean correct and inappropriate responses for both types of training. She also scored higher on weekly assessment scores during rebus training. The data indicates that Subject One scored more correct responses and retained more information during rebus than during speech training.

Behavior. A. Table 3 indicated and Figures 1 and 2 illustrate, elicited inappropriate responses were less in rebus than in speech

TABLE 3

Mean Percentage of Responses

Subject One

Responses	Free Play Baseline	Conditions: Structured Baseline verbal	Structured Baseline non-verbal	Rebus	Speech
Elicited Correct		0	5.9	36.9	14.7
Elicited Inappropriate		92.4	88.6	33.1	63.6
Unelicited Inappropriate[a]		82.4		53.9	68.2
Unelicited Inappropriate[b]	86				

[a]Twenty-second pauses

[b]Continuous ten-second intervals

Figure 1. Percent Elicited Inappropriate Responses of Subject One.

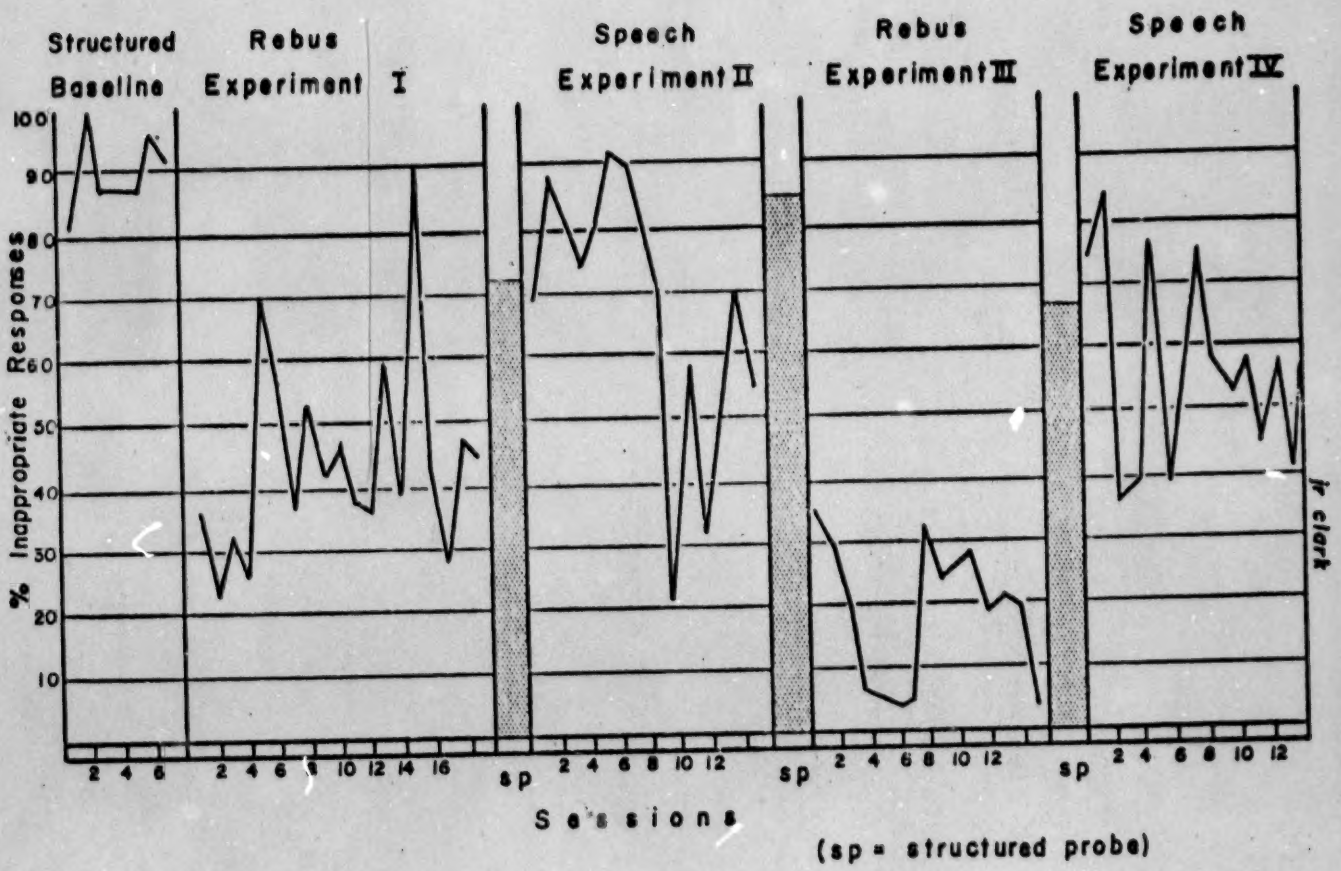
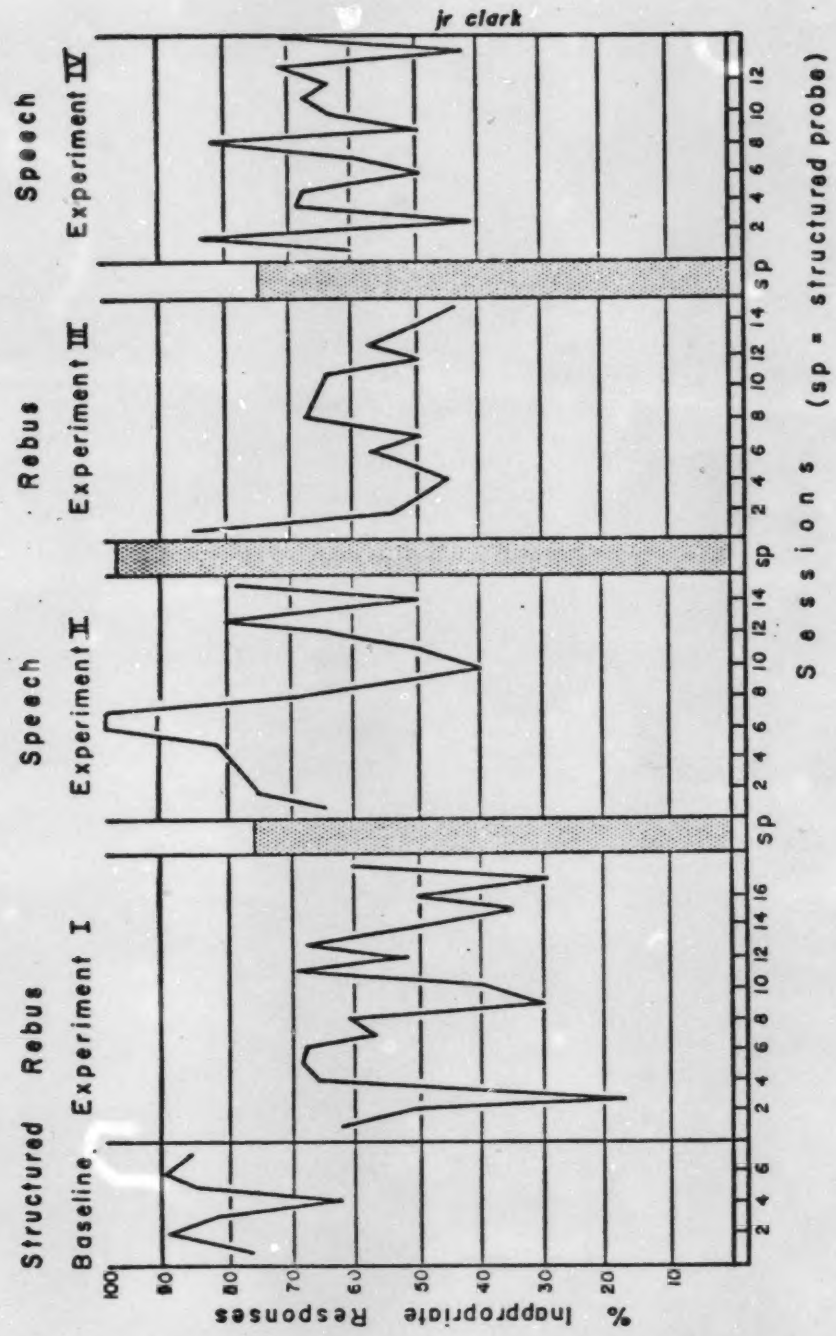

Structured Baseline
Rebus Experiment I
Speech Experiment II
Rebus Experiment III
Speech Experiment IV
% Inappropriate Responses
100
90
80
70
60
50
40
30
20
10
2 4 6
2 4 6 8 10 12 14 16
sp
2 4 6 8 10 12
sp
2 4 6 8 10 12
sp
2 4 6 8 10 12
Sessions
(sp = structured probe)
jr clerk

Figure 2. Percent Ten-Second Intervals in which Inappropriate Behavior Occurred Between Tasks for Subject One.


jr clark
Structured Rebus
Baseline
Experiment I
Speech
Experiment II
Rebus
Experiment III
Speech
Experiment IV
% Inappropriate Responses
Sessions (sp = structured probe)

training. This pattern was present in the first two training conditions but is best illustrated by an examination of training conditions III and IV in Figure 1. Reduced inappropriate responses evident in the rebus condition sharply increase when speech is reintroduced.

Unelicited inappropriate responses during the 20-second pauses are also less during rebus than during speech training although the differences are not as dramatic (Figure 2).

Summary. Subject One had more correct responses and higher weekly assessment scores during rebus training than during speech training. She also exhibited fewer inappropriate responses during rebus than during speech training. This was true of elicited and unelicited responses.

The introduction of non-reinforcement (probes) in a previously reinforced setting sharply increased her inappropriate responses. This is an indication that frustration induced inappropriate responding in this particular child.

Weak reinforcement and ignoring of inappropriate behavior did not bring Subject One's behavior under stimulus control. Her inappropriate behavior remained at rather high levels throughout the study. It is evident, however, that training in communication with symbols elicited less inappropriate behavior than requiring her to vocalize.

Subject Two

Baseline and probes. During the free play baseline Subject Two engaged in inappropriate behavior during 70.2 percent of 10-second intervals scored. This behavior consisted of fixating on visual objects while emitting a number of bizarre motor movements with her

hands and feet. She played appropriately with small cars and made very tiny figures of play dough. Her language was inappropriate and bizarre; e.g., "car's burning," "it's dark out, it's light out" repeated over and over throughout the baseline period.

During the structured baseline Subject Two scored 62.7 percent correct on verbal items and 64.7 percent correct on non-verbal items. Inappropriate responses were 21 percent for verbal requests and 31 percent for non-verbal requests. This indicates that Subject Two responded slightly better to verbal stimuli. Her inappropriate responses during 20-second pauses in the structured baseline condition were 79.3 percent.

Subject Two's reactions to probes and non-reinforced sessions were not dramatic. Inappropriate responses increased in free play when visual fixation was not interrupted by the teacher. Non-reinforcement had a minimal effect on her inappropriate behavior, an indication that this was either not frustration producing, or that frustration was not one of the cues which set off inappropriate responding in this child (Figures 3 and 4).

Speech training. Speech training began in Experiment I and continued in Experiment III. All weekly assessment scores are contained in Appendix C. The child was encouraged to complete the "subject-verb" sequence and to eliminate the "ing" from the ending of all of her verbs. This was accomplished by presenting her with a series of pictures of boys and girls in various standing and sitting positions. Since she seemed confused over the pronouns "he," "she," and "they," time was spent in teaching her to differentiate them. In retrospect,

this task was too difficult, particularly when the stimulus was alternated among the three pronouns.

When speech training resumed in Experiment III emphasis was placed on the "subject-verb-object" sequence and pronouns were avoided. Stimuli were made more functional; e.g., "Who gives the apple?" She progressed through the "subject-verb-object" sequence and speech training ended with instruction in the use of the prepositions "in" and "under." Subject Three's correct responses in speech training were 70.3 percent (Table 4) and she reached criterion (85 percent) on many of the phrases tested in weekly assessment sessions.

Rebus training. Rebus training was begun with attempts to have Subject Two sequence the symbol cards for an action such as, "Nancy gives Mary apple." She reached criterion quickly and was next presented with the opportunity to demonstrate her understanding of the concept "same." She failed in 3 weeks of training to show that she understood the concept (Appendix C). She also failed in attempts to select the correct symbol for "name of" and "color of."

In the second phase of rebus training the symbol for the verb "touches" was introduced and she reached criterion quickly in sequencing the symbol cards for actions such as "Nancy touches apple." She scored somewhat lower when she was required to complete an action for a symbolic phrase. Toward the end of rebus training she showed that she understood the concept "yes/no" by choosing the correct symbol for a symbolic phrase such as, "Nancy touches car? yes/no."

An examinatic of the data in Table 4 shows that Subject Two scored slightly more correct responses in speech training than in

TABLE 4

Mean Percentage of Responses

Subject Two

Responses	Free Play Baseline	Conditions: Structured Baseline verbal	Structured Baseline non-verbal	Rebus	Speech
Elicited Correct		62.7	64.7	67.1	70.3
Elicited Inappropriate		21	31	7.5	3.6
Unelicited Inappropriate[a]		79.3		37.7	26.2
Unelicited Inappropriate[b]	70.2				

[a]Twenty-second pauses

[b]Continuous ten-second intervals

Figure 3. Percent Elicited Inappropriate Responses of Subject Two.

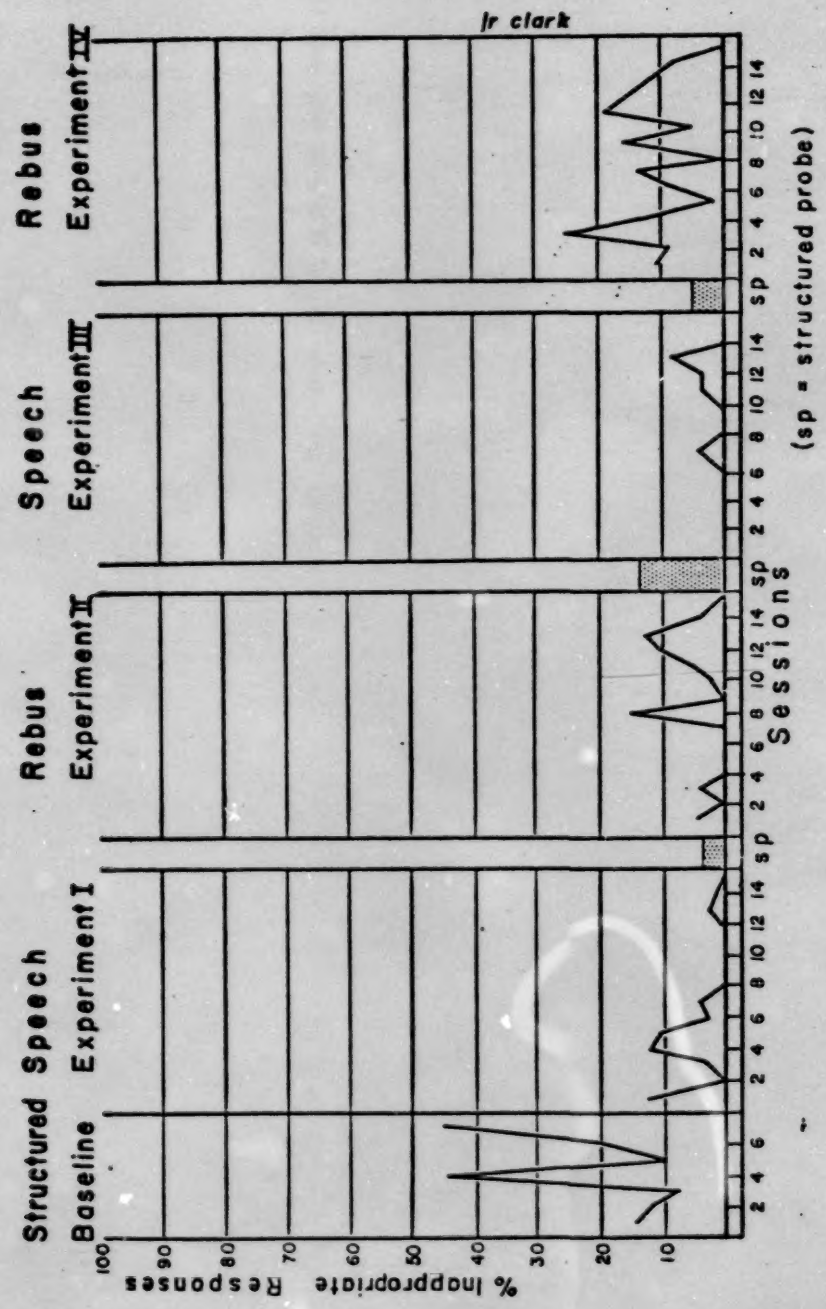
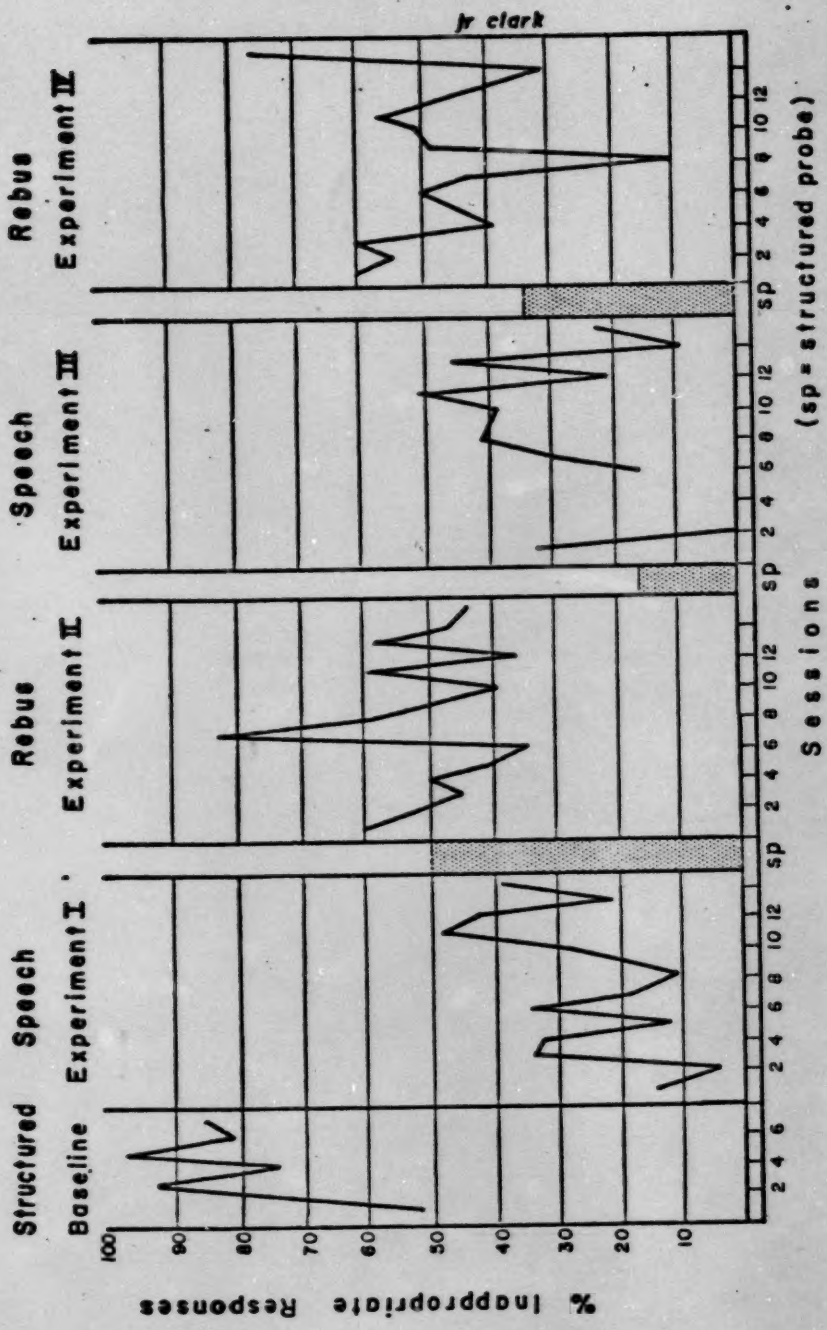

Jr clark
Structured Speech Baseline
Experiment I
Rebus
Experiment II
Speech
Experiment III
Rebus
Experiment IV
% Inappropriate Responses
Sessions
(sp = structured probe)

Figure 4. Percent Ten-Second Intervals in which Inappropriate Behavior Occurred Between Tasks for Subject Two.


jr clark
Structured Baseline
Speech Experiment I
Rebus Experiment II
Speech Experiment III
Rebus Experiment IV
% Inappropriate Responses
Sessions
(sp = structured probe)

rebus training.

Behavior. An examination of Figures 3 and 4 shows that Subject Two scored more inappropriate elicited and unelicited responses in rebus training. This result was expected in view of her scores in the structured baseline and the fact that she obviously fixated on visual objects and pictures and that these visual stimuli appeared to elicit bizarre motor movements. Ornitz (1971) has observed this reaction in autistic children and states that, "autistic children frequently induce sensory input as they produce motor output (p. 65)." Mean percent inappropriate responses are contained in Table 4.

A close examination of Figures 3 and 4 reveals an interesting pattern which was typical of three of the four subjects in this study. That was the tendency to respond appropriately to the stimulus presented and then to engage in a variety of inappropriate responses. This behavior pattern was noticed during the initial phases of the study and was captured by the 20-second pauses between stimulus presentations.

Summary. Subject Two had fewer inappropriate responses and a large number of correct responses in speech training. The differences were not dramatic. She had a tendency to respond correctly to a stimulus, and then to engage in inappropriate behavior. The absence of reinforcement did not appear to induce frustration nor to increase inappropriate responses in Subject Two.

Subject Three

Baseline and probes. Subject Three engaged in inappropriate behavior during 68.4 percent of 10-second intervals scored in the free

play baseline. This behavior was comprised of delayed echolalia, tapping and staring intensely at objects, eye-blinking, occasional muscular contractions of the arms and hands, and screaming. He also evidenced occasional hand biting. During the free play sessions he played appropriately with play dough, cars, blocks, and crayons and paper.

In the structured baseline sessions Subject Three scored 39.5 percent correct responses on verbal items and 55.7 correct responses on non-verbal items, an indication that he fared better in non-verbal tasks. Inappropriate responses during this time correlated with the correct responses; 46.8 percent inappropriate responses for verbal requests and 33.8 percent inappropriate responses for non-verbal requests.

Probe sessions in which no reinforcement was forthcoming slightly increased unelicited inappropriate responses. Elicited inappropriate behavior was usually greater than in free play but comparable to behavior exhibited in previous training sessions. This indicated that non-reinforcement produced some frustration and increased slightly the inappropriate responses of Subject Three.

Speech training. Speech training began in Experiment I and was continued in Experiment III. Assessment scores are presented in Appendix C. Initially Subject Three was reinforced for naming responses and for pointing to the correct card for named objects. Object cards were changed after the first week of training to cards which were more indicative of household objects. Subject Three scored more correct responses when required to point to cards, rather than to verbalize the

appropriate names. He also did well when asked such questions as, "You sleep in a ? ." Towards the end of the first speech training phase he uttered some spontaneous expanded phrases; e.g., "drink with cup," "put on boots."

During the second phase of speech training the "subject-verb-object" sequence was introduced in the form of the stimulus-response sequence; "Who has the apple?" "Bill has the apple." The verb "has" appeared to be too difficult, but when the stimulus sentence was changed to, "What does Bill want?", his scores improved.

The mean percent correct responses in speech training was 64 percent (Table 5). He showed the ability to name many objects and to expand phrases spontaneously. He appeared to be able to indicate by gesture the appropriate object more easily than to verbalize the name. He had difficulty learning phrases which contained the verb "has."

Rebus training. Rebus training began with attempts to have the child sequence rebus cards for actions performed by the teacher. He had the ability to sequence two symbols, but difficulty arose when three symbols were introduced. In retrospect, sequencing practice should have been continued until three symbol combinations had been mastered, but at that time the concept "same/different" was introduced. During the first week of training in "same/different" he scored 80 percent correct responses in the weekly assessment session. This result was not expected in view of Subject Two's limited performance on this same concept. Apparently complexity of language constructions is no indication of whether a child has such concepts of "same/different."

At this point in rebus training Subject Three exhibited a pattern of behavior which was seen in all of the children at one time or another. That was the tendency to score at or above criterion level on a task one week, and then to fail in that same task the following week. For instance, for the task "same/different," Subject Three scored 80 percent the first week and 47 percent the second week on the same subject matter (Appendix C).

During the second phase of rebus training sequencing of rebus cards was reintroduced and the child learned to sequence four symbol cards appropriately. As Table 5 indicated Subject Three scored slightly higher in rebus training than in speech training, but the difference was very slight.

Behavior. Figures 5 and 6 indicate that inappropriate responses of Subject Three were only slightly greater in speech than in rebus training. Unelicited responses were slightly greater in rebus training, as result which is difficult to explain. However, the differences in inappropriate behaviors between speech and rebus training are not definitive enough to make any statements about the efficacy of one type of training over another for Subject Three.

Subject Three exhibited the tendency previously mentioned to respond appropriately to a stimulus and then to engage in inappropriate behavior. His inappropriate responses showed inconsistencies from one session to another. Some days were bad and some good, a pattern which is evident from an examination of weekly assessment scores (Appendix C).

Summary. Subject Three scored more correct responses and fewer inappropriate responses during the non-verbal tasks on the structured

TABLE 5

Mean Percentage of Responses

Subject Three

Responses	Free Play Baseline	Conditions: Structured Baseline verbal	Structured Baseline non-verbal	Rebus	Speech
Elicited Correct		29.5	55.7	68.9	64
Elicited Inappropriate		46.8	33.8	6.9	12.3
Unelicited Inappropriate[a]		59.4		38.6	28.4
Unelicited Inappropriate[b]	68.4				

[a]Twenty-second pauses

[b]Continuous ten-second intervals

Figure 5. Percent Elicited Inappropriate Responses of Subject Three

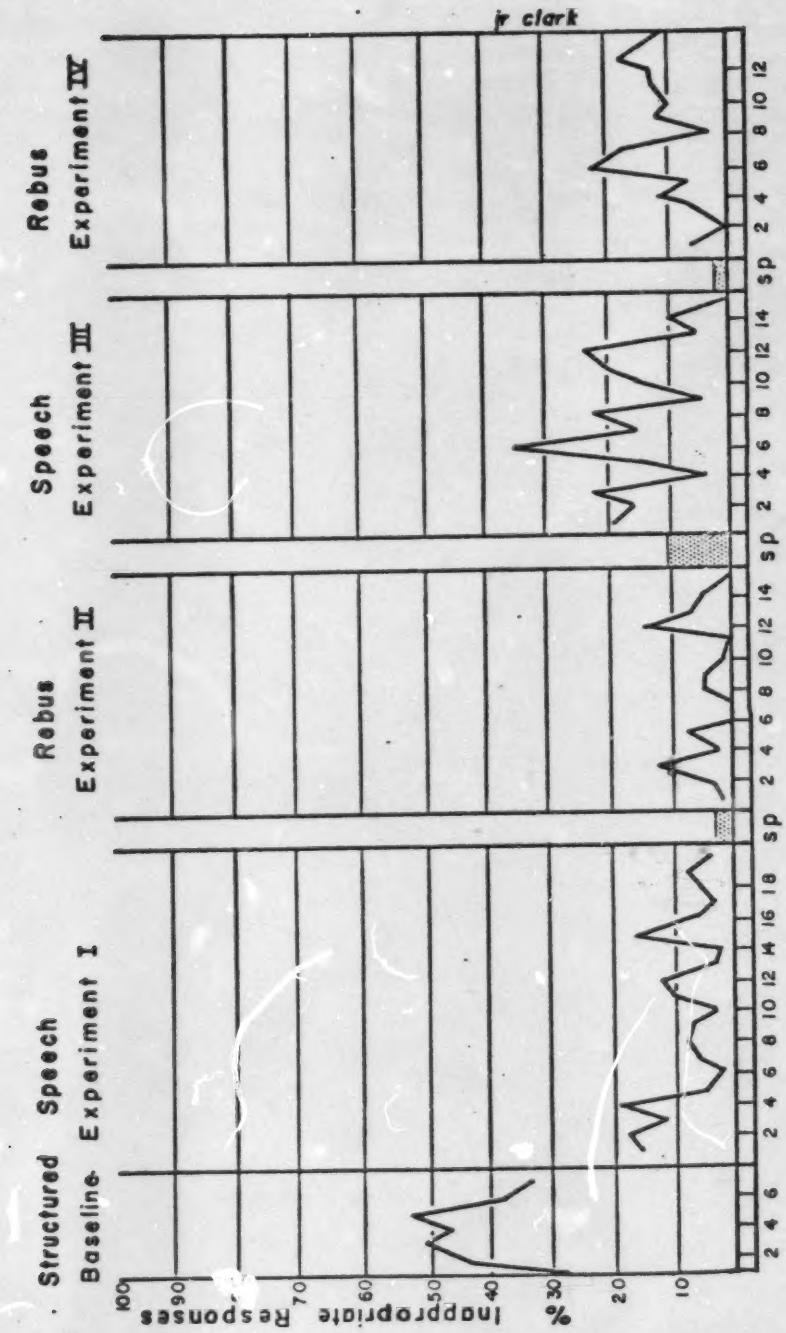
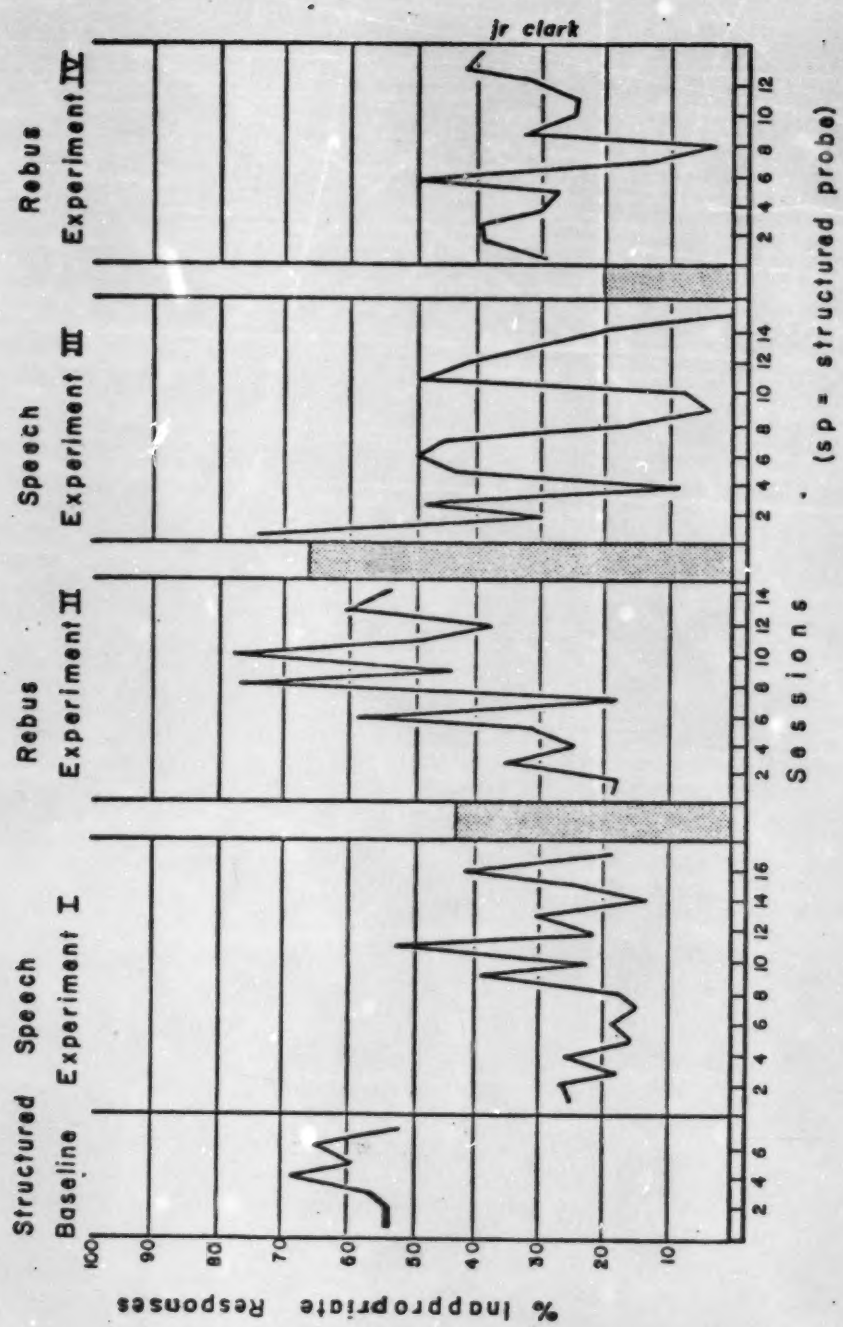

jr clark
Structured Speech
Baseline Experiment I
Rebus
Experiment II
Speech
Experiment III
Rebus
Experiment IV
Inappropriate Responses
%
Sessions
(sp = structured probe)

Figure 6. Percent Ten-Second Intervals in which Inappropriate Behavior Occurred Between Tasks for Subject Three


jr clark
Structured Speech
Baseline
Experiment I
Rebus
Experiment II
Speech
Experiment III
Rebus
Experiment IV
% Inappropriate Responses
Sessions
(sp = structured probe)

baseline. This tendency did not carry over significantly in rebus training, although he did score slightly more correct responses and fewer inappropriate responses in rebus than in speech training. His unelicited inappropriate responses were greater (again slightly) in rubus than in speech training.

The absence of social and tangible reinforcement when they were expected slightly increased inappropriate responding in Subject Three.

Subject Four

Baseline and probes. Subject Four's responses were the most inconsistent of all of the children involved in the study. During the free play baseline she exhibited inappropriate behavior in 33.9 percent of 10-second intervals scored. However, this inappropriate behavior varied in extreme from one session to another from a high of 66 percent to a low of 11 percent. Inappropriate behavior in free play sessions consisted almost entirely of tantrumous responses such as screaming, throwing objects, and attempts to kick and hit the teacher. She also tried to leave the room. When this behavior reached an extreme, she was restrained in her seat, but no punishment was used. She exhibited few rocking responses in these sessions, although that appeared to be the predominant inappropriate behavior in the classroom. She played appropriately with the play dough, the cars, and the crayons and paper during a large portion of the free play period.

During the structured baseline she scored 37.4 percent correct responses for verbal requests and 49 percent correct responses for non-verbal tasks. However, she demonstrated more inappropriate responses to non-verbal requests (49.4 percent non-verbal, 42 percent

verbal). Her inappropriate responses during the 20-second pauses increased sharply when she was required to complete tasks. Inappropriate behavior occurred in 63.1 of 10-second intervals scored between trials in the structured baseline.

Non-reinforcement appeared to increase unelicited inappropriate responses in two of the three structured probe sessions. It appeared that non-reinforcement produced frustration in some instances.

Speech training. Speech training began in Experiment II and continued in Experiment IV. The "subject-verb-object" was taught with the emphasis on correct use of "I" and "you." She reached criterion on the use of "I," but when "you" was introduced she had difficulty. "You" was then trained to criterion, and both "I" and "you" responses were required. When she was required to give both responses her correct responses decreased to 20 percent. During the second phase of speech training the verb "wants" was trained in a "subject-verb-object" sequence in which pronouns were avoided. This type of training was continued and she reached criterion of 89 percent correct responses for three types of sentences at the end of the second speech phase. All weekly assessment scores are contained in Appendix C.

The mean percent correct responses in speech training were 56.9 (Table 6). She was capable of emitting any number of naming responses, and had many constructions. However, she seemed to emit just the amount required to make herself understood. Speech training took the form of eliciting language which could be understood and which contained the types of constructions of which she was capable. There

TABLE 6

Mean Percentage of Responses

Subject Four

Responses	Free Play Baseline	Conditions: Structured Baseline verbal	Structured Baseline non-verbal	Rebus	Speech
Elicited Correct		37.4	49	69.4	56.9
Elicited Inappropriate		42	49.4	7.5	10.4
Unelicited Inappropriate[a]		63.1		29.7	42.4
Unelicited Inappropriate[b]	33.9				

[a]Twenty-second pauses

[b]Continuous ten-second intervals

were certain constructions which were difficult for her such as the use of "I/you." When it appeared that an impasse had been reached, a less difficult task was presented.

Rebus training. Rebus training in Experiments I and III began with attempts to ascertain how many of the symbols Subject Four could identify by name. She identified all of the symbols on the first and second trial. At that point, the use of the symbols for "on," "in," and "under" was trained. An examination of Appendix C illustrates the pattern of behavior referred to earlier. The first week of training she nearly reached criterion on the prepositions; the second week her scores fell by 20 to 40 percent.

During the second phase of rebus training sequencing of symbols for actions was introduced. She performed well on this task and was soon sequencing four symbols. When the concept "same/different" was introduced, she scored close to criterion one week and then the next week failed the task.

As Table 6 indicates, she scored more correct responses in rebus than in speech training. However, her responses were so inconsistent from day to day and the differences so slight that it would be impossible to say that one type of training induced more learning than another.

Behavior. Table 6 indicates that there were less inappropriate responses in rebus training than in speech training. However, an examination of Figures 7 and 8 shows that the first rebus training and the last speech training conditions are similar to one another. For elicited responses at least it is not possible to make a statement

Figure 7. Percent Elicited Inappropriate Responses of Subject Four

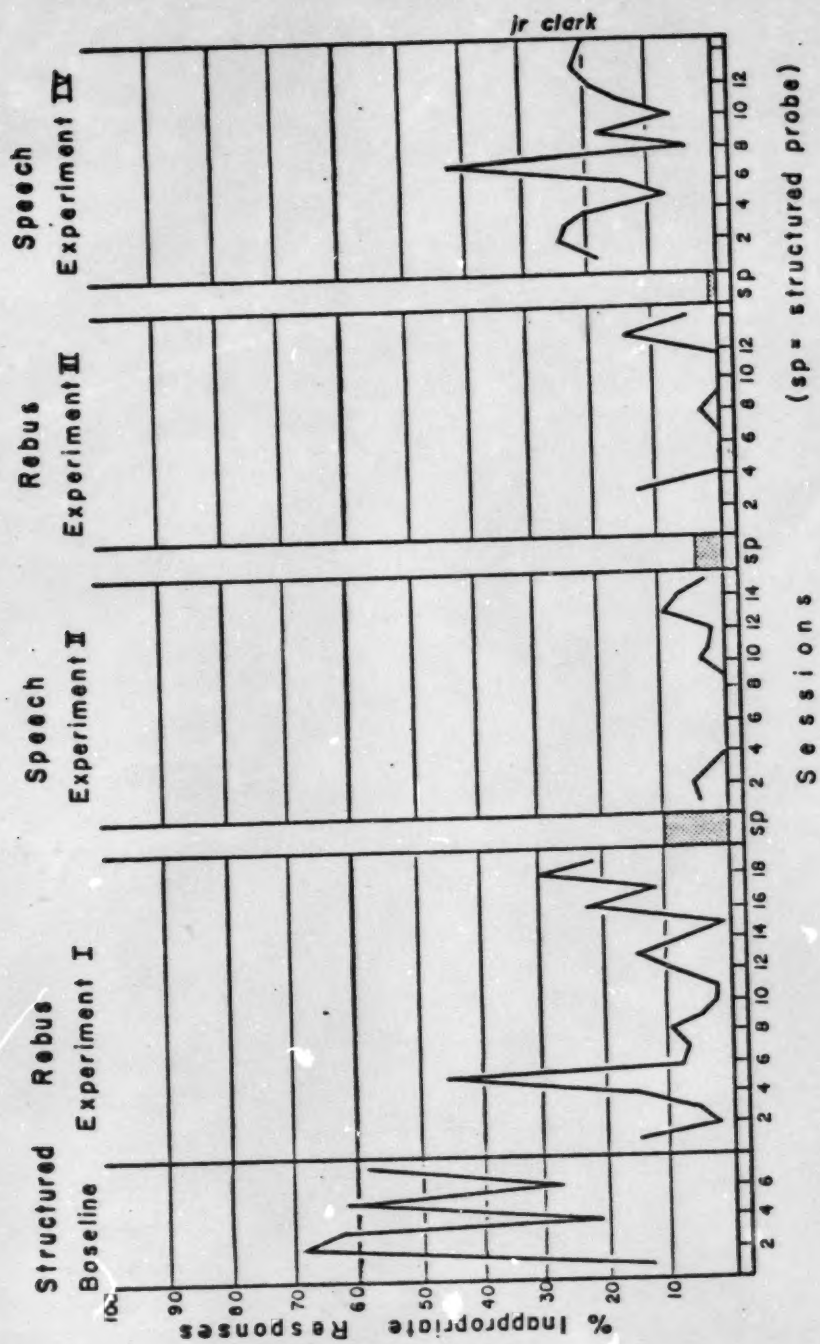
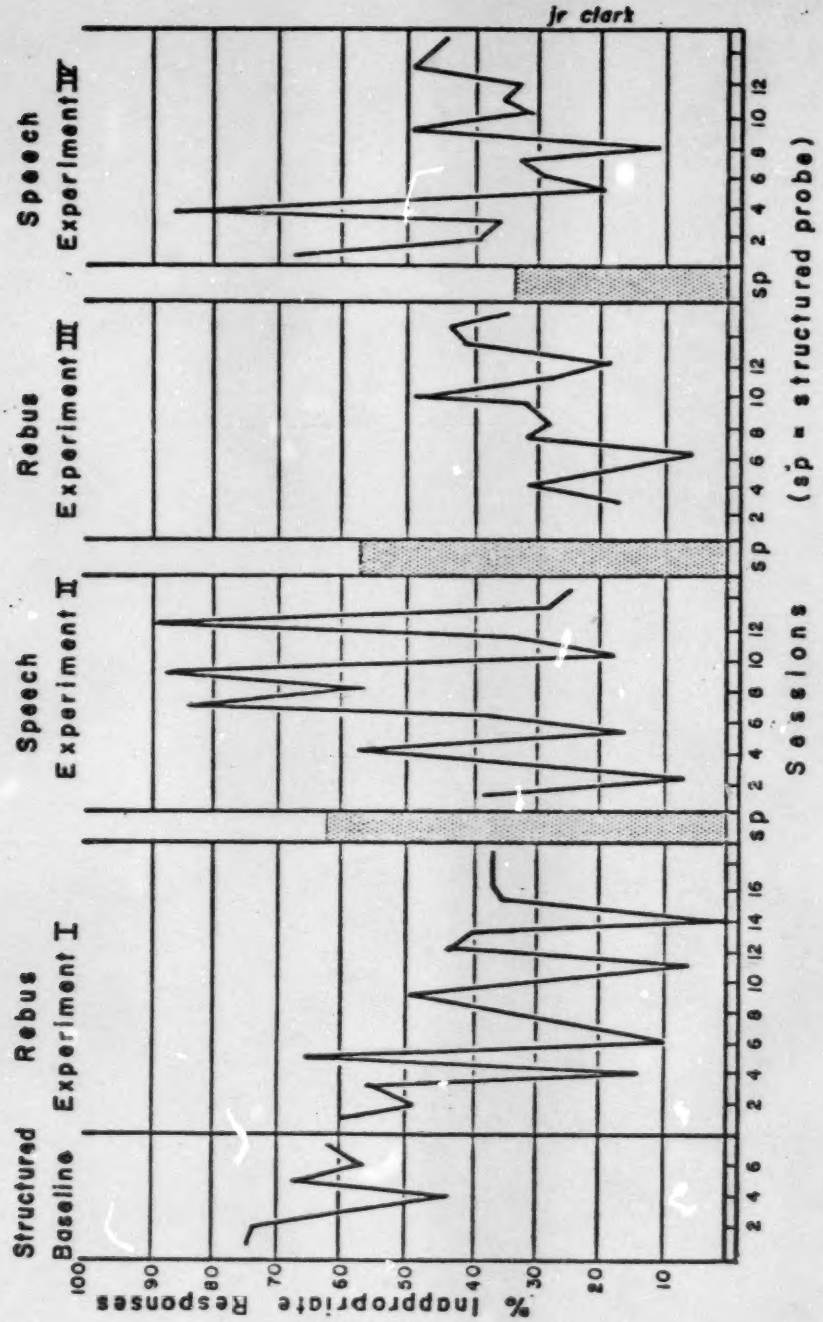

jr clark
Structured Rebus Boseline
Rebus Experiment I
Speech Experiment II
Rebus Experiment II
Speech Experiment IV
% Inappropriate Responses
Sessions
(sp = structured probe)

Figure 8. Percent Ten-Second Intervals in which Inappropriate Behavior Occurred Between Tasks for Subject Four.


jr clark
Structured Baseline
Rebus Experiment I
Speech Experiment II
Rebus Experiment III
Speech Experiment IV
% Inappropriate Responses
Sessions
(sp = structured probe)

of the effects of one method of teaching over another in the production on inappropriate responses.

Subject Four showed the same tendency as Subject's Two and Three to respond appropriately to a stimulus and then to engage in inappropriate behavior. Her unelicited inappropriate responses appear to be less in rebus than in speech training, but again these responses are so inconsistent that it is difficult to make a statement about the data.

Summary. Perhaps the most significant aspect of Subject Four's behavior was her tendency to respond appropriately to a stimulus and then to engage in inappropriate behavior which fluctuated from day to day. The percent of inappropriate responding in 10-second intervals ranged from zero to 90 percent. Because of this wide variation in her performance, it is not possible to conclude that one type of training was more effective than another.

She showed a tendency to increase inappropriate responding when non-reinforcement was introduced.

Reliability

Reliability was obtained for each child during baselines and during each experimental condition. At only one point did the percent agreement fall below the 80 percent mark, and at that time the observers were immediately retrained. That score (72 percent) occurred for Subject One who demonstrated a subtle form of eye and head turning. Table 7 contains reliability scores for all subjects.

TABLE 7

Reliability Scores for All Subjects

	Subject One	Subject Two	Subject Three	Subject Four
Free play baseline	91	89	85	85
Structured play				
trials	90	90	93	83
intervals	88	92	95	93
Experiment I				
trials	84	97	90	84
intervals	72	92	96	89
Experiment II				
trials	94	100	88	95
intervals	100	94	88	83
Experiment III				
trials	absent	89	100	93
intervals		90	100	83
Experiment IV				
trials	95	100	92	97
intervals	92	100	83	86

Summary of Results

Rebus Training versus Speech Training

1. Two subjects (Three and Four) showed no apparent significant difference in inappropriate responding during the two types of instruction.

2. One subject (Two) showed slightly fewer inappropriate responses in speech training.

3. One subject (One) responded with fewer inappropriate responses in rebus training.

In addition to the results obtained from the observation procedure, certain behavioral characteristics of the children were noticed during the experimental sessions.

1. Tangible reinforcers and extinction procedures did not eliminate inappropriate behaviors. The children demonstrated the tendency to give an appropriate response immediately after a stimulus was presented, to be reinforced, and then to engage in inappropriate behavior between tasks.

2. Three of the four children appeared to respond to one aspect of a complex stimulus, ignoring other relevant aspects of that stimulus. For instance, when a visual cue was presented along with a verbal request, the child would attend to the visual picture and ignore or delay the verbal response.

3. The children showed inconsistencies in their attention and retention from session to session.

CHAPTER V

DISCUSSION

Rebus versus Speech Training

The results of this study indicate that rebus training was as effective as speech training with autistic children. However, inappropriate behaviors were not substantially reduced across subjects during symbolic instruction. The introduction of a non-speech response mode of instruction did not appear to have an effect on the behavior of three of the four subjects. The elimination of the need to decode a verbal symbol, to hold it in memory, and to vocalize did not have the hypothesized effect on the learning and behavior of the four subjects.

There has been some suggestion in the literature that surmounting the language deficit in severely handicapped children is the first step in the "prosthesis of intelligence (Hollis & Carrier, 1975, p. 411)." The results of this study indicate that for three of four autistic children, the language problem may not be the primary dysfunction. The dysfunction in autism includes the inability to deal with all symbols, verbal and non-verbal. The children exhibited the same problems in attending to and sequencing rebus as well as speech stimuli.

Subject One exhibited fewer inappropriate responses immediately after the stimulus was presented during the second phase of rebus training. She was the only one of the subjects who was functionally

mute, and was at a more primitive level of development than the other three children in this study. She also began to utter spontaneous verbalizations during speech and rebus training and after the experiment had ended she began to utter words. At the present time she has a vocabulary of 50 words. It is possible that for autistic children who are mute and functioning at a primitive level, instruction with rebus symbols will reduce inappropriate responses and trigger imitative speech. Certainly, symbolic instruction with mute subjects warrants further investigation.

For the present it appears that the emphasis placed on speech and language instruction is appropriate for autistic children. Instruction with rebus symbols is also a suitable technique for beginning instruction in communication and reading. The two methods which require different response modes might be alternated in classroom instruction, and particularly for mute children, the symbolic approach might be emphasized.

Mastery and Behavior

The inappropriate responses of Subject One indicate that, in her case, there was a connection between the ability to master the task required of her and her behavior. When all other conditions were maintained, she had fewer inappropriate responses during rebus training than during speech training which required her to vocalize. These fewer inappropriate responses correlated with her increased correct responses in rebus training. Because the other subjects did not vary significantly either in their correct responses or inappropriate

behaviors it is not possible to postulate this relationship between mastery and inappropriate responding for them.

Hyperselective Attention

Informal observation of the children during instruction yielded information which supports the hypothesis of Lovaas et al. (1974) that autistic children tend to select one aspect of a complex stimulus to respond to. When a visual cue (picture) was presented to the child and a verbal command such as, "What does Nancy have?" presented, the child's attention remained on the visual cue and the verbal response was either late or not forthcoming. The children exhibited the tendency to look away from a visual cue when a verbal response was required. When a blue ball was presented and the child was to select from the following paired symbols, blue-ball, blue-tree, or yellow-ball, the child would respond to either the color or shape dimension but not to both.

Although this type of data is not substantiated here by formal analysis, the implications of this type of deficit might explain the severity of the behavior disorder. Lovaas et al. (1974), have listed some of the responses which may be affected by hyperselective attention. They include the acquisition of appropriate affect as well as meaningful speech.

Attention is one of the prerequisites of observational learning or modeling behavior (Bandura, 1971). The ability to observe the behavior of other and to construct from those observations new patterns of behavior is basic to the acquisition of normal social responses. If

as Bandura states, "the behaviors displayed by others varies on a number of stimulus dimension which differ in content, complexity, and discriminability (p. 33)," then the inability to attend to a variety of cues or a complex stimulus might explain the inability of autistic children to develop normal social behavior.

The tendency to select one aspect of a complex stimulus to respond to, and to vary that selection from session to session (and within sessions) might explain the very inconsistent scores the children received on their weekly tests.

Tangible Rewards and Extinction

It is evident that candy rewards and extinction procedures did little to influence the reduction of inappropriate responses. The children tended to respond appropriately immediately after a stimulus was presented, to receive their reward, and then to engage in self-stimulatory or tantrumous behavior. It can be argued that the candy may not have been a reinforcer at all for these particular children since their negative behaviors did not decrease with reinforcement and ignoring. The issue may be more complicated than that. The children did respond to praise and rewards immediately after a specific request was made by exhibiting an appropriate response. However, that appropriate responding did not carry over even into the next 20-seconds after the stimulus response sequence. Because the inappropriate behavior which autistic children exhibit may be intrinsically rewarding and because in this case there were no negative consequences to such behavior, it continued between tasks throughout

the training sessions.

The fact that inappropriate behavior of autistic-like children cannot be eliminated with tangible reward and extinction has certain implications for classroom teachers and for training institutions. They must address themselves to the ways in which such behavior can be eliminated, and construct teacher training programs which include information on this particular aspect of behavior control. Recent studies by Foxx and Azrin (1973) suggest that overcorrection procedures

> (1) to overcorrect the environmental effects of an inappropriate act and (2) to require the disruptor intensively to practice overly correct forms of relevant behavior (p. 2),

may be more effective than punishment or reinforcing incompatible appropriate behavior in eliminating autistic self-stimulation. Certainly the relative merits of using these different methods of behavior control should be openly discussed, investigated, and the best procedures applied in the teaching of autistic children.

Limitations of the Study

The behavior exhibited by these four children cannot be generalized to the population of children labeled autistic. However, their responses do give an indication that mute and echolalic children may respond differently to a non-verbal response mode of instruction. It is possible that if four mute subjects had been chosen for the study, symbolic instruction would have significantly decreased inappropriate responding. Further investigations of this type should differentiate subjects on the basis of whether they exhibit speech or whether they are mute. The fact that this study did not do so limits the conclusions

that can be drawn.

It is possible that the children in this study might have responded differently if three-dimensional plastic symbols had been used. At the time of the initiation of this study no standardized materials of this sort were on the market. Since then a new language initiation program which contains 60 three-dimensional geometric symbols has been developed and is on the market (Carrier & Peak, 1975). The use of symbols which the children could manipulate might have overcome the attention problem, although the opposite effect may have occurred.

The other limitations of the study were inherent in the design. The use of four subjects limits generalizations but is necessary in view of the fact that the children labeled "autistic" are so variable in their behavior. When enough data has been collected by studying the behavioral responses of single subjects in different situations, sub-groups of such children can be created which rely on more relevant definitive characteristics than subjective labels, IQ scores, or EEG data.

The fact that the children received different lessons which were planned by the teacher and speech therapist on the basis of such information as language samples and behavioral characteristics, leaves open the question of whether they might have responded differently to a different instructional program. Because the children were all at different instructional levels, they could not possibly have received the same programs. Future studies of this type might find it more suitable to construct a formal language procedure, so that subjects

are passing through a structured sequence of stimulus events at different levels.

Implications for Further Research

There are many implications for continued research in the area of curriculum development for autistic children which have been suggested by this study.

Symbols in Instruction

Continued use of symbols with mute autistic subjects is indicated. Observations of behavior and occurrences of the onset of speech in conjunction with symbol training should be documented. Studies which employ the use of three-dimensional symbols with autistic children need to be conducted to determine if the manipulability of these symbols helps to overcome the attention problems which the children exhibit.

Cues and Prompts

If autistic children respond to one aspect of a complex stimulus, is it better to teach them with a variety of prompts or with no prompts at all? Lovaas et al. (1974) have suggested that the use of cues may inhibit learning in autistic children by confusing them. On the other hand, it might be possible to train such children to respond to a number of cues in a stimulus presentation. An interesting way to approach this problem would be to conduct research with autistic children who have been trained to attend. The type and complexity of stimulus presentations might be varied and reaction time and quality of the responses of the children measured. At present teachers of severely

handicapped children are taught to use a variety of prompts in teaching. If it appears that this procedure is contraindicated for autistic children, the fact should be documented.

Behavior Control in the Classroom

Classroom observations of autistic children under the influence of different methods of behavior control should be conducted to demonstrate the efficacy of using either one method or another.

Conclusions

This study indicates that symbolic instruction may be effective in establishing appropriate responses and triggering speech in mute autistic subjects, but that the use of symbols with echolalic children may not be warranted. Further investigations which differentiate subjects according to their speech productions need to be conducted before conclusions can be drawn concerning curriculum development. Included in these investigations should be studies which use three-dimensional symbols.

In view of the fact that three of the four children in this study had similar difficulties in attending to and sequencing verbal and symbolic stimuli, and did not appear to increase correct responding when a non-speech response was required, the theory of autism as a primary disorder of language should be questioned. The informal observations of the tendency of three subjects to attend selectively supports other research and indicates that the attention rather than the language factor should be the focus of future investigation.

APPENDICES

APPENDIX A

Baseline Tasks

Free Play Baseline

Objects available for the child to manipulate included:

1. crayons and paper
2. play dough
3. puzzle
4. toy cars
5. blocks

Structured Baseline

Tasks required of the child were divided into verbal and non-verbal categories and included:

Verbal tasks.

1. Stimulus items-picture cards presented with the question "What is this?" (a) hat (b) ball (c) key (d) telephone
2. Objects presented with the question "What is this?" (a) chair (b) key (c) car (d) box (e) fork (f) flag
3. Sentence repetition presented as, "Say, I am a big boy."
4. Abstract verbal items presented as, (a) "Brother is a boy, sister is a _____." (b) "In daytime it is light, at night it is _____." (c) "Father is a man, mother is a _____." (d) "The snail is slow, the rabbit is _____."

Non-verbal tasks.

1. Placing forms in three hole form board.
2. Pointing to the following on a large doll picture: (a) mouth (b) feet (c) ear (d) nose (e) hands (f) eyes
3. Building a block tower with four blocks. Presented as, "Do as I do."

APPENDIX A (Continued)

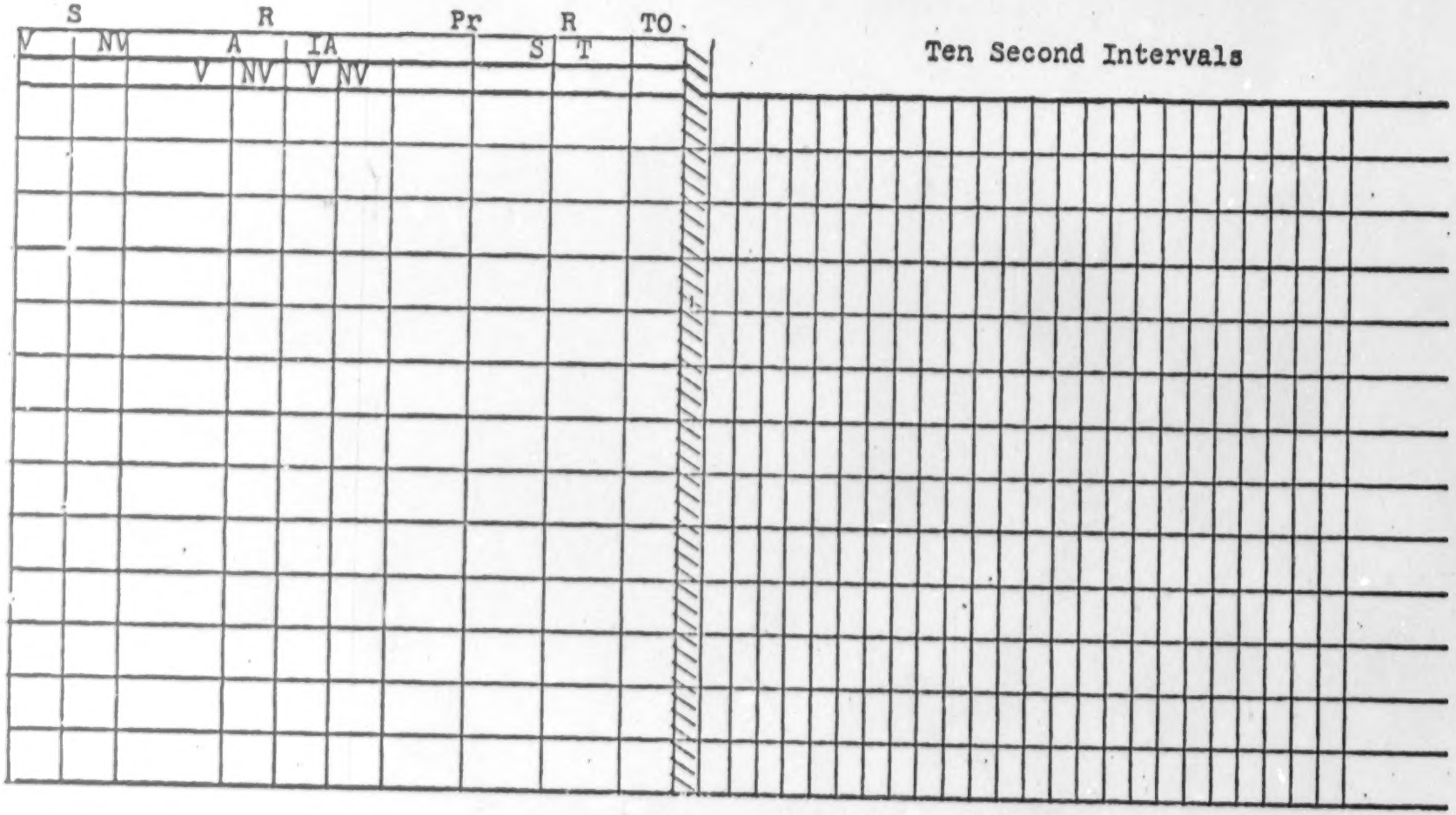
4. Pointing to the following objects on an object card: (a) doll (b) train (c) scissors (d) dog (e) ball (f) bed.

*All items adapted from the Stanford Binet Intelligence Test

APPENDIX B

Scoring Protocol

Name _____ Training _____ Session _____ Date _____



APPENDIX C

Summary of Weekly Assessment Scores

Child One

Condition	Stimulus/Response		Score (Percent)
Experiment II	Speech		
1. 1/6/75	ball puppy	any vocalization within 10 seconds	0
2. 1/10/75	ball puppy	"	0
3. 1/20/75	ball puppy	"	15 0
4. 1/28/75	ball	"	10
Experiment IV	Speech		
1. 3/8/75	ball	"ba" or "ball" (any approximation to "ball"	19
2. 3/19/75	ball	"	8
3. 3/25/75	ball	"	75
Experiment I	Rebus		
1. 11/15/74	object/rebus/manual sign	imitation of manual sign	
	ball		25
	hat		20
2. 11/22/74	object/rebus/manual sign	imitation of manual sign	
	ball		33
	book		63
	hat		0

APPENDIX C

Summary of Weekly Assessment Scores

Child One

Condition		Stimulus/Response		Score (Percent)
3.	12/17/74	pick symbols for objects:	pointing response	
		ball		0
		hat		0
		book		0
		pick object for rebus symbol:	"	
		hat		0
		book		0
Experiment III		Rebus		
1.	2/6/75	point to symbol for object:	pointing response	
		banana		62
		truck		60
		ball		63
2.	2/13/75	point to symbol for object:	"	
		banana		60
		truck		62
		ball		60
3.	2/21/75	point to symbol for object:	"	
		banana		100
		truck		25
		ball		25

APPENDIX C

Summary of Weekly Assessment Scores

Child One

Condition		Stimulus/Response		Score (Percent)
4.	3/28/75	point to symbol for object:	pointing response	
		banana		42
		truck		80
		ball		50

APPENDIX C

Summary of Weekly Assessment Scores

Child Two

Condition		Stimulus/Response		Score (Percent)
Experiment 1		Speech		
1.	11/15/74	pictures of girls and boys:		
		"who sits/stands"	"he"	74
		etc.	"she"	71
			"they"	85
		pictures of boys and girls standing, walking etc.:		
		"she ___?___"	"stands"	100
		"he ___?___"	"sits"	100
		"they ___?___"	"walks"	100
2.	11/22/74	ill		
3.	12/17/74	pictures of girls and boys:		
		"who sits/stands?	"he"	87
			"she"	20
			"they"	100
Experiment III		Speech		
1.	2/6/75	"Who has the obj.?"	"Mary has the obj."	100
2.	2/13/75	Action: Nancy gives obj. to Mary and says "Who gives the obj.?"	"Nancy gives obj. to Mary"	66
3.	2/21/75	Action and "who gives the obj.?"	"Nancy gives the obj."	100
		"What does Mary want?"	"Mary wants obj."	100

APPENDIX C

Summary of Weekly Assessment Scores

Child Two

Condition		Stimulus/Response	Score (Percent)	
4.	2/28/75	Action: Put object in box, "What did Nancy do?"	"Put the obj. in the box."	100
		Action: Put object under table, "What did Nancy do?"	"Put the obj. under table."	44
Experiment II		Rebus		
1.	1/6/75	Action: Nancy gives Mary obj.	Sequence rebus cards:	
			Nancy banana	100
			Nancy banana Mary	90
			Nancy give banana Mary	89
		Action: Present two like objects with one unlike object.	Move symbol for same between the two like objects.	45
2.	1/10/75	Action: Nancy give Mary object.	Sequence cards: Nancy give Mary obj.	100
		Action: Present two like and one unlike object.	Move symbol for same between two objects.	57
3.	1/20/75	Action: Present two like and one unlike object.	Move symbol for same between two objects.	51
4.	1/28/75	Present object: Sequence rebus cards, e.g., truck _____ obj. truck	Pick card name of and place between rebus and object.	47

APPENDIX C

Summary of Weekly Assessment Scores

Child Two

Condition	Stimulus/Response	Score (Percent)
Experiment IV	Rebus	
1. 3/8/75	Action: Nancy touches object.	Sequence rebus cards: Nancy touches obj. 69
	Action: Mary touches object.	Sequence rebus cards: Mary touches obj. 100
2. 3/19/75	Action: Nancy touches object.	Sequence rebus cards: Nancy touches obj. 100
	Action: Nancy gives Mary object.	Sequence rebus cards: Nancy give Mary obj. 86
3. 3/25/75	Rebus sentence: Mary give Nancy obj.	Mary has to comply by doing what the sentence requests. 80
	Action: Nancy gives Mary object.	Mary sequences rebus cards: Nancy gives Mary obj. 80
	Action: Nancy touches one of three objects. Presents sentence: Nancy touches obj. Yes/No	Mary chooses symbols Yes or No 71

APPENDIX C

Summary of Weekly Assessment Scores

Child Three

Condition	Stimulus/Response		Score (Percent)
Experiment I	Speech		
1. 11/15/74	Present picture cards.	Name cards:	
		bike	100
		plane	100
		boat	100
		fork	100
		sliding board	100
		bat	36
		bus	75
		ball	75
		shaving	47
		fishing	29
		swining	58
		sliding	0
		playing	33
2. 11/22/74	Present object cards.	Name cards:	
		car	100
		table	80
		cup	71
		spoon	67
		coat	80
		bed	100
		tree	20
		stove	100
		Point to cards for obj. named:	
		car	100
		table	100
		cup	100
		spoon	100
		coat	100
		bed	100
		tree	100

APPENDIX C

Summary of Weekly Assessment Scores

Child Three

Condition	Stimulus/Response	Score (Percent)
Experiment I	**Speech**	
3. 12/17/74	Present object cards.	Name cards:
		cup 100
		plane 67
		tree 33
		stove 100
		coat 67
		bed 100
		spoon 100
		ball 100
		table 67
		boots 67
		car 100
	Present three cards: Say, "You sleep in a _____?"	Pointing to correct card.
		cup 100
		plane 33
		tree 100
		stove 100
		coat 100
		bed 67
		spoon 100
		ball 100
		table 100
		boots 67
		car 100
		Spontaneous expansions: "drink with cup" "put on your coat" "put on your boots" "cook on stove"
Experiment III	**Speech**	
1. 2/6/75	Action: Bill holds object. Say, "Bill has the apple. Bill has _____."	"the apple" 0

APPENDIX C

Summary of Weekly Assessment Scores

Child Three

Condition		Stimulus/Response		Score (Percent)
2.	2/13/75	Action: Bill holds the apple. Say, "Who has the apple? Bill _____."	"has the apple"	54
		Action: Nancy holds the apple. Say, "Who has the apple? Nancy _____."	"has the apple"	33
3.	2/21/75	Action: Bill holds the apple. Say, "Who has the apple. Bill _____."	"has the apple"	43
		Hold up object. Say "What does Bill want? Bill wants _____."	"the truck"	0
4.	2/28/75	Hold up object. Say "What does Bill want?"	"Bill want obj."	70
Experiment II		Rebus		
1.	1/6/75	Action: Nancy gives Bill banana.	Sequence rebus cards: Nancy banana.	90
		Action: same	Nancy banana Bill.	45
2.	1/10/75	Action: Nancy gives banana Bill.	Sequence cards: Nancy give banana Bill.	33
		Present two like and one unlike object.	Move symbol for same between two like objects.	40

APPENDIX C

Summary of Weekly Assessment Scores

Child Three

Condition		Stimulus/Response	Score (Percent)	
3.	1/20/75	Present two like and one unlike object.	Move symbol for same or different between two like or unlike objects.	80
4.	1/28/75	Present two like and one unlike object.	Move symbol for same or different between two like or unlike objects.	47
Experiment IV		Rebus		
1.	3/8/75	Action: Nancy touch object.	Sequence rebus cards: Nancy touch obj.	11
		Same	Nancy obj.	45
2.	3/19/75	Action: Nancy touches object.	Sequence rebus cards: Nancy touch obj.	90
		Action Nancy gives object to Bill.	Sequence rebus cards: Nancy gives obj.	70
3.	3/25/75	Action: Nancy gives Bill object.	Sequence rebus cards: Nancy gives obj.	85
		Same	Nancy gives obj. Bill	64

APPENDIX C

Summary of Weekly Assessment Scores

Child Four

Condition		Stimulus/Response		Score (Percent)
Experiment II		Speech		
1.	1/6/75	Action: Debbie holds object. Say, "What do you have? I _____"	"have obj."	0
2.	1/10/75	Action: Debbie holds object. Say, "What do you have?"	"I have obj."	100
		Action: Nancy holds object. Say, "What do I have?"	"You have obj."	0
3.	1/20/75	Action: Debbie holds object. Say, "What do you have?"	"I have obj."	100
		Action: Nancy holds object. Say, "What do I have?"	"You have obj."	31
4.	1/28/75	Action: Nancy holds object. Say, "What do I have?"	"You have obj."	90
		Both	"I have obj." "You have obj."	20
Experiment IV		Speech		
1.	3/8/75	Action: Hold up object. Say, "What does Debbie want?"	"I/Debbie want obj."	50
2.	3/19/75	Action: Hold up object. Say, "What does Debbie want?"	"I/Debbie want obj."	31

APPENDIX C

Summary of Weekly Assessment Scores

Child Four

Condition	Stimulus/Response	Score (Percent)
3. 3/25/75	Action: Debbie holds object. Say, "What does Debbie have?"	"I/Debbie have obj."
	"What does Debbie want?"	"I/Debbie want obj." 65
	"What did Debbie do?"	"I/Debbie gave obj. to Nancy."
4. 4/10/75	Same	Same 89
Experiment I	Rebus	
1. 11/15/74	Presentation of rebus symbols.	Naming 88 Pointing 96
		book, cat, chair, blue, black, red, house, bird, coat, two, green, box, yellow, in, is, so, my, on, yes, under, dog, table, hat, they
2. 11/22/74	Action: Placing a piece of candy on, in, and under a box.	Pointing to symbol on, in, or under
		on 83 in 75 under 71
3. 12/17/74	Action: Place piece of candy in, on, under box.	Point to symbol on, in, under.
		on 67 in 33 under 33

APPENDIX C

Summary of Weekly Assessment Scores

Child Four

Condition	Stimulus/Response	Score (Percent)
Experiment III	Rebus	
1. 2/6/75	Action: Nancy gives Debbie banana.	Sequence rebus cards: Nancy banana Debbie. 100
	Same	Nancy give Debbie banana. 40
2. 2/13/75	Action: Nancy gives truck to Debbie.	Sequence rebus cards: Nancy truck Debbie. 85
		Nancy give truck Debbie. 100
3. 2/21/75	Action: Present two like and one unlike object.	Move symbol for same between like objects. 76
		Move symbol for different between unlike objects. 77
4. 2/28/75	Action: Present two like and one unlike object.	Move symbol for same between two like objects. 31

APPENDIX D

Mean Percent Responses for All Subjects

Subject	Elicited		Unelicited
Subject One	Correct	Inappropriate	Inappropriate
Free Play baseline I			86
St. baseline I	2.7	90.6	82.4
Experiment I rebus	31.1	44.3	51.7
Free Play baseline II			46
St. baseline II	10	73	76
Experiment II speech	9.8	66.9	73.4
Free Play baseline III			67
St. baseline III	10	73	98
Experiment III rebus	29.3	21.9	56
Free Play baseline IV			51
St. baseline IV	7	67	70
Experiment IV speech	19.5	60.2	63
Subject Two			
Free Play baseline I			70.2
St. baseline I	63.6	22.1	79.3
Experiment I speech	66.3	3.5	24.8

APPENDIX D

Mean Percent Responses for All Subjects

Subject	Elicited		Unelicited
Subject Two (cont.)	Correct	Inappropriate	Inappropriate
Free Play baseline II			44
St. baseline II	83	3	48
Experiment II rebus	62.3	4.2	49.4
Free Play baseline III			41
St. baseline III	81	7	15
Experiment III speech	74.3	3.6	27.5
Free Play baseline IV			43
St. baseline IV	69	3	34
Experiment IV rebus	71.9	10.7	47.9
Subject Three			
Free Play baseline I			68.4
St. baseline I	47.4	41	59.4
Experiment I speech	70.7	9.1	25.7
Free Play baseline II			30
St. baseline II	63	3	43
Experiment II rebus	59.3	4.1	43.6

APPENDIX D

Mean Percent Responses for All Subjects

Subject	Elicited		Unelicited
Subject Three (cont.)	Correct	Inappropriate	Inappropriate
Free Play baseline III			21
St. baseline III	57	10	66
Experiment III speech	57.3	15.5	31
Free Play baseline IV			24
St. baseline IV	68	0	20
Experiment IV rebus	78.5	9.7	33.6
Subject Four			
Free Play baseline I			33.9
St. baseline I	43.3	45.6	63.1
Experiment I rebus	65.9	11.7	36.6
Free Play baseline II			7
St. baseline II	90	10	62
Experiment II speech	57.6	2.5	44.7
Free Play baseline III			11
St. baseline III	73	3	58
Experiment III rebus	72.9	3.3	29.7

APPENDIX D

Mean Percent Responses for All Subjects

Subject	Elicited		Unelicited
Subject Four (cont.)	Correct	Inappropriate	Inappropriate
Free Play baseline IV			74
St. baseline IV	90	0	31
Experiment IV speech	56.2	18.3	40.1

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